THE ELECTRICAL WORLD

A Weekly Review of Current Progress in Electricity and its practical Applications

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Steam Engines for Driving Dynamo-Electric Machines.

The dynamo-electric machine is in reality but an apparatus for converting energy, supplied to it under the form of mechanical motion by a steam engine or other source of motive power, into energy of another kind—electricity—that is itself to be subsequently transformed into other forms, such as light, motion, etc. It is only a natural consequence, therefore, that the satisfactory and complete solution of any problem involving the use of a dynamo-electric machine—especially electric lighting—so far from depending altogether on the perfection of the dynamo-electric machine itself, or of the lamps or other accessories which go to make up a "system," should depend largely on the quality of the energy out of which the electricity is to be evolved; that is to say, the excellence of the power and of the conditions under which it is delivered to the dynamo-electric machine.

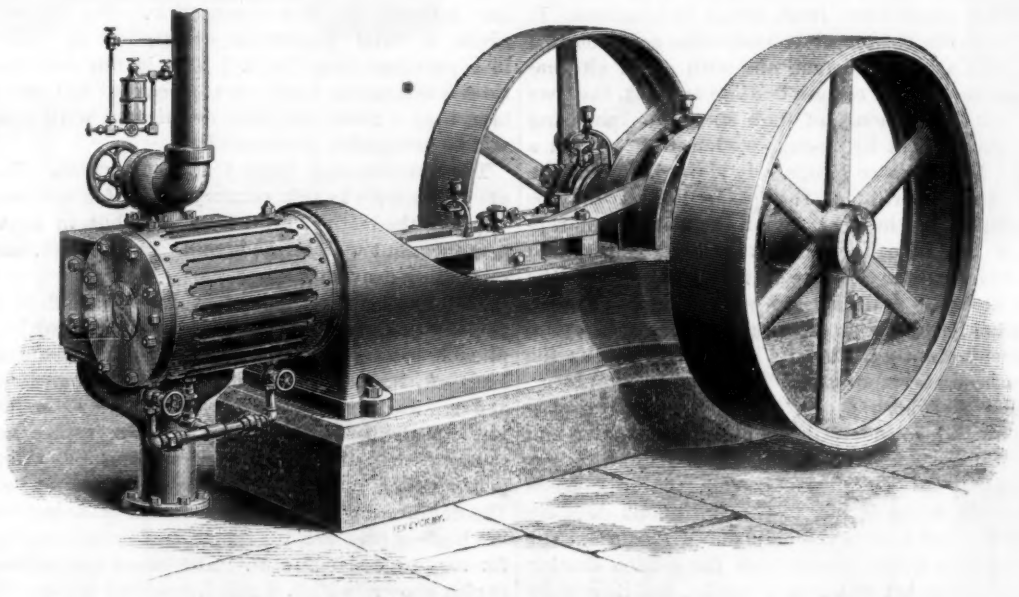

FIG. 1.—ARMINGTON & SIMS ELECTRIC LIGHT ENGINE—FRONT VIEW.

The majority of electricians were somewhat slow to recognize the relation, it must be admitted. They seemed to ignore entirely the importance of the rôle played by the steam engine in electric lighting. They had no suspicion that the requirements of an engine for driving dynamo-electric machines were vastly different from those of an engine suitable for driving the machinery of a factory, and in the selection of an engine for an installation, any good engine with a reputation, and whose requirements conformed with those of standard engineering practice, seemed worthy of consideration. However, practical experience with engines has taught electricians since then to realize the direct and powerful influence which the behavior of a steam engine has on the success, not to speak of the economy of results, of an electric light installation.

The same experience also disclosed in an unmistakable manner the defects inherent in each type or class of engine, while it pointed out to the mechanical engineer a new and fruitful field wherein to apply his inventive skill.

The problem which the mechanical engineer is required to solve in designing a steam engine adapted for driving dynamos, is one which is well calculated to tax his skill, to wit: *The rotation must be even and uniform; the speed produced must be maintained perfectly and constantly steady, under any variations of load from zero to the maximum duty of the engine, and no matter how quickly the variations take place.* The latter portion of this proposition emphasizes the importance of providing sensitive and accurate regulating devices. The task which such a requirement as the above imposes on the regulating devices may be appreciated by the fact that when used for other ordinary purposes, an engine scarcely ever needs to anticipate fluctuations greater than from thirty to fifty per cent. of the whole load. It may be urged that under ordinary circumstances, the engine in an electric lighting installation is not called upon to adapt its supply of power to such great variations; but there remains, nevertheless, the constant, impending danger of the circuit being suddenly opened and as suddenly closed, which would in reality call for this requirement. Aside from this requirement, there are others which are not of lower importance, and which the designer must keep in mind. That of economy is, indeed, of almost paramount importance. The economy of first cost dictates simplicity of construction and compactness.

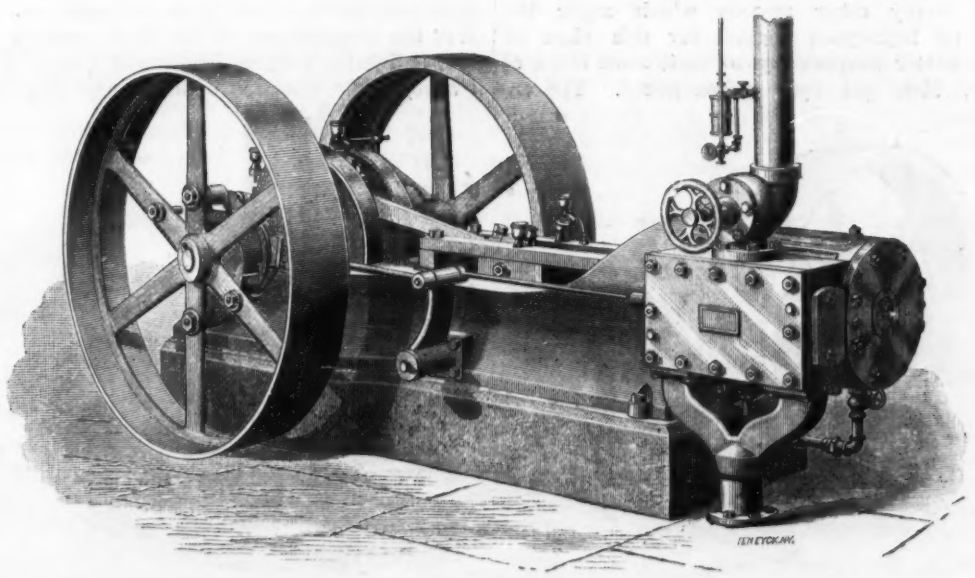

FIG. 2—ARMINGTON & SIMS ELECTRIC LIGHT ENGINE.—VIEW SHOWING VALVE GEAR.

So does the economy in repairs, which calls in addition for strength of material and solidity of arrangement, so as to afford durability. The economy of fuel demands a thorough consideration of the principles which guide the best recognized practice among engineers.

The first and most self-evident principle of economy is evidently to prevent all waste of steam heat at the cylinder, and radiation or conduction must be guarded against. It is also important to prevent or at least to reduce as much as possible the condensation of the steam in the cylinder. There is always some condensation going on in that end of the cylinder from which the steam is being exhausted, and this means a loss of heat, for when the steam is again admitted into this end, it becomes chilled in part by giving off heat to re-evaporate the water resulting from this condensation. While endeavoring to obviate all losses of heat energy in the steam from the above causes, the design of the engine should aim to the use of the steam to the greatest advantage by providing for expansive working, which is a well-established principle of economy. The pressure exerted by steam in a cylinder may be considered as identical with the effort made by a compressed gas to expand in bulk. If the pressure is maintained until the piston reaches the end of the cylinder and until the exhaust begins, the expansion takes place outside, and at a period of the motion of the piston when any pressure which it can exert by expansion is of no value in producing motion, but on the contrary is likely to oppose the return movement of the piston. On the other hand, if we "cut off" the supply of steam when the piston has moved only a certain distance, say one-half or one-fourth of its stroke, then the steam in the cylinder can expand in bulk and exert a pressure due to this expansion, which is therefore utilized while the steam is economized at the same time. The pressure of expansion diminishes rapidly, but there is added to this the momentum acquired by the moving (reciprocating) parts under the influence of the full pressure at the beginning of the stroke, so that the effort exerted on the crank will remain constant.

The conditions of efficiency and of economy so far enumerated are not peculiar entirely to engines intended for driving dynamo-electric machines, for they have been realized to a very satisfactory degree in the best types of automatic cut-off engines. But we come now to another desideratum or requisite, and in many respects the most important, namely, *high speed*, which is dictated by several reasons and which forms the chief characteristic of the engine designed especially for driving dynamo-electric machines. This requisite is interesting from the fact that it involves a somewhat radical departure from standard practice—a departure which has not yet received the sanction of the more conservative engineers.

The first reason which calls for high speed of piston in steam engines for electric lighting plants is the necessity of even and uniform rotation of crank stated above. The best steam indicator fails to indicate the uniformity or want of uniformity in the motion of the piston, but an electric lamp is an "indicator" which tells it with readiness and precision, simply because the dynamo wavers and staggers, so to speak, under every variation of speed

and the supply of current fluctuates correspondingly. It was Mr. Edison who first learned the value of the electric lamp as an indicator, and it was he also who first profited by its lessons and made the first experiments with engines run at a speed that looked like recklessness in the eyes of many engineers. Mr. Edison found that when his dynamos were driven from a slow engine, with countershafting, the lamps told him by a slight wavy flicker that the engine slacked a trifle just as it passed over each "dead centre." Now it is easy to reason that this defect must disappear in proportion as the speed is increased. If our engine runs at 50 and our dynamo at 1000, then if the engine slackens as it passes over the dead centre say one-tenth of a revolution, there will be two revolutions of the dynamo slackened. If the dynamo is to be driven at a still greater speed, as is not infrequent, the number of revolutions affected by the slackening of the engine will necessarily be greater. Now, suppose the engine shaft runs at the same speed as the armature, as in the steam dynamos of Mr. Edison, in which the crank rod of the engine is coupled to the armature shaft. Assuming for convenience that each rotation of the engine involves the same period of slackening, the result affects each rotation of the armature precisely alike, and thus uniformity is attained. It is believed by many practical engineers, moreover, that with short strokes and high piston speed, this period of slackening is practically eliminated, and that the motion is in fact approximately as even as that of the turbine, which has no dead centres. This smoothness of rotation is attained, too, without necessitating the use of large balance wheels, as is the case with slow engines. The balance wheel may be very much smaller and yet its regulating power will be as great or greater, simply because the speed is increased. The balancing power of a fly-wheel varies in direct proportion with the weight, but according to the *square of the velocity* of the wheel. It is clear, therefore, that an increase in velocity makes up readily for a decrease in weight. The use of a smaller fly-wheel and the short stroke which results from high speed lead to compactness, so that the engine is proportionally small for its power and requires much less space.

There are many other reasons which argue the adaptability of high-speed engines for this class of duty. Their better adaptability to their work is one of the foremost. Here again space is economized. The engine can be either speeded up sufficiently to admit of direct connection to the armature shaft, or it can at all events be bolted direct. In this way the countershaft with its attendant complication and annoyance is avoided. Moreover the high speed of the engine renders the use of smaller driving pulleys admissible. The immediate advantages deriving from this are great. The dynamo can be placed quite near the engine, and though the belt be short its sides will still be sufficiently parallel to reduce slipping to a minimum. Compare this with the use of countershafts, which as a rule necessitate the use of long convergent belts, each of which allows a certain amount of slipping, and we can doubly appreciate the adaptability of the high-speed engine.

There is another reason which argues in favor of high speed. This is a potent one, for it reaches into the pocket book—that of economy. We have alluded above to the fact that condensation in the exhaust end of the cylinder leads to a waste of steam heat, because re-evaporation of the water takes place when fresh steam is admitted. If we concede that the amount of condensation going on in a given time with a given surface and with given alternations of temperature is a certain definite amount, then we can reason on the economy of high speed by comparing the loss of steam heat by re-evaporation to a leak in a water pipe. If the water moves very slowly through the water pipe the proportion of the loss by leakage may be very great, but if, on the other hand, the water flows rapidly through the tube the proportion of loss is much smaller, and the greater the rate of flow of the water the greater the economy realized. So with the steam engine. The more quickly the steam is worked through the cylinder, the more promptly it does its work, so to speak; the less the loss from re-evaporation.

The requisite of high speed, of course, leads to important incidental considerations which the designer and the constructor must bear in mind. There is naturally a greater tendency to wear and tear in the high-speed engine, specially when it has to do continuous duty for days, and even weeks, as in the hands of Mr. Edison. The vibrating impulses which result from the sudden darting of the piston at the beginning of a stroke, and its equally sudden stop at the end, must be provided for by good proportioning and proper balancing in the moving parts. Friction, it need scarcely be said, must be avoided and eliminated as much as possible, and in case of continuous working it becomes incumbent to provide for automatic lubrication.

We have now briefly reviewed the problem of steam engines for driving dynamo-electric machines. The analysis of the requirements of the most suitable engine for electric lighting purposes leads us by a logic of its own, as it were, in the direction of high-speed engines, notwithstanding the contrary opinion of many able engineers However, while avowing our preference for the high speed engine, we are bound to admit that circumstances alter cases, here as well as elsewhere. There are undoubtedly many situations where slower moving engines would prove useful, and it might be even preferable to high-speed engines. Only we contend that it is the exception rather than the rule. We feel warranted in expressing this opinion by the fact that nearly all the engines now laying claim to special adaptability for electric lighting plants are of the high-speed variety.

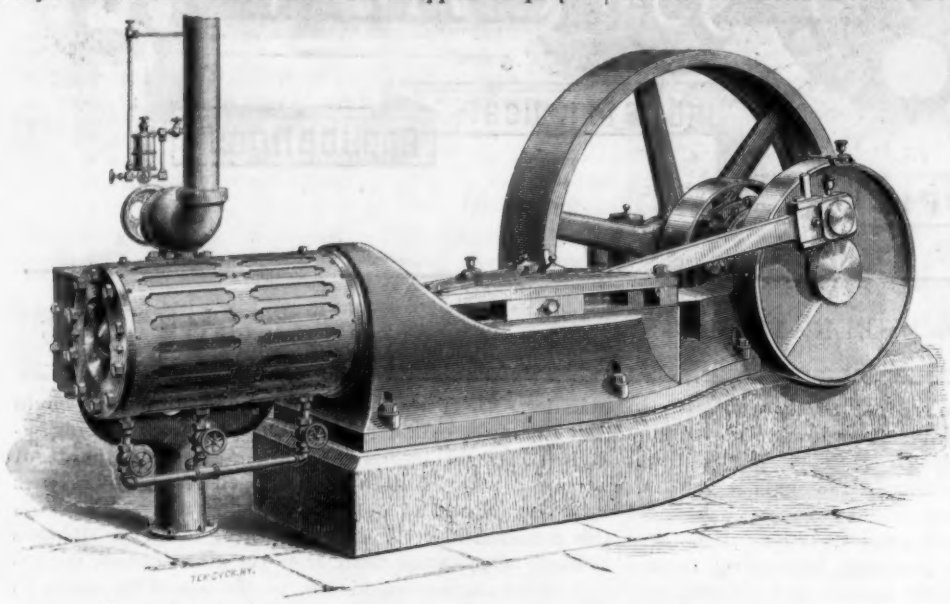

FIG. 3.—LARGE TYPE ARMINGTON & SIMS ENGINE.—FRONT VIEW.

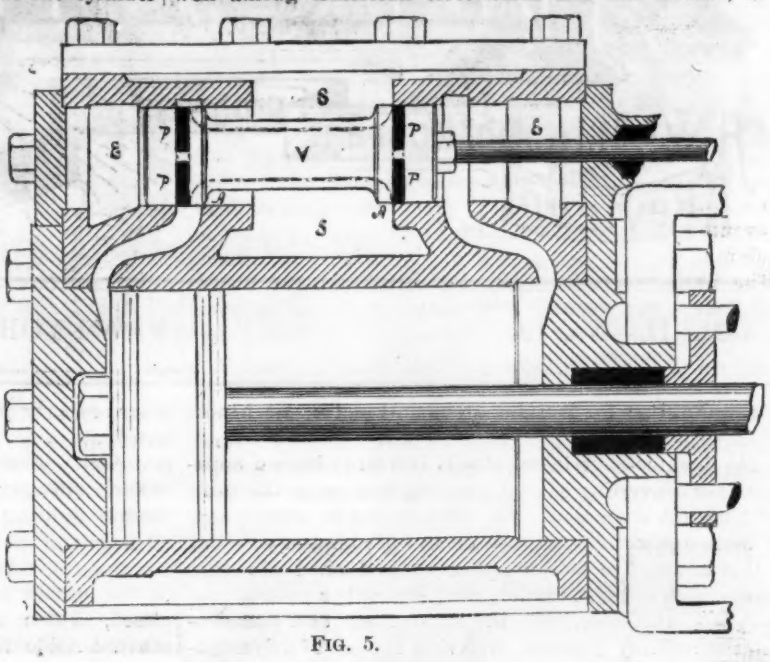

FIG. 5.

THE ARMINGTON & SIMS ENGINE.

We have selected this well-known engine as the first in our analysis of the construction and merits of the various types of steam engines suitable for driving dynamo-electric machines, because the uniform success attending its use everywhere, and the favorable reputation which it has won among American electricians and also abroad, in various parts of Europe, gives it a place of commanding interest in this connection. We have already given a brief illustrated description of this engine in a previous issue (Sept. 1 ult.). in our article on "The Edison system on board steam vessels," but we feel certain that a more complete description with illustrations will be acceptable to our readers.

The Armington & Sims Co., of Providence, R. I., who are the makers in this country, manufacture two distinct types of the engine, differing somewhat in outward appearance, but which embody the same valve, movement, regulating-gear, etc.

The smaller type, shown in Figs. 1 and 2, is more especially adapted to high speed, and is more particularly applicable to electric lighting purposes. It is made of various sizes—A, B, C, etc.—ranging from 15 to 75 horse-power or above. The horse-power is calculated by the usual formula on the basis of an initial pressure of 80 pounds per square inch, cutting off at one-fourth stroke. With higher pressures the power obtained will of course be greater. The engines are made so as to admit of being worked at the highest pressure, the strength of parts being calculated for very excessive strains. The larger type or single disc-engine shown in Figs. 3 and 4, so called because the crank-pin is attached to a single disc, instead of two, as in the smaller or double disc type, is adapted for all classes of work. These engines may be used single, with power varying according to size, from 75 to 250 horse-power, or they may be combined in pairs, in which case the power is doubled.

The bed of the Armington and Sims engines is a slightly modified "Tangye" bed approximating closely to the Porter-Allen engine bed. It is cast very heavy with ribs lengthwise and crosswise inside, so as to insure strength and stiffness. The cylinder (Figs. 5, 6,) is independent of the bed, to which it is fastened by studs screwed from inside. This facilitates its removal in case repairs or changes are to be made. The slide bars are made solid, and their surfaces are large and carefully fitted. In the electric light type, which is the type of particular interest in the present connection, the main bearings for the crank shaft are formed by the bed itself as shown by the figures (1, 2). A

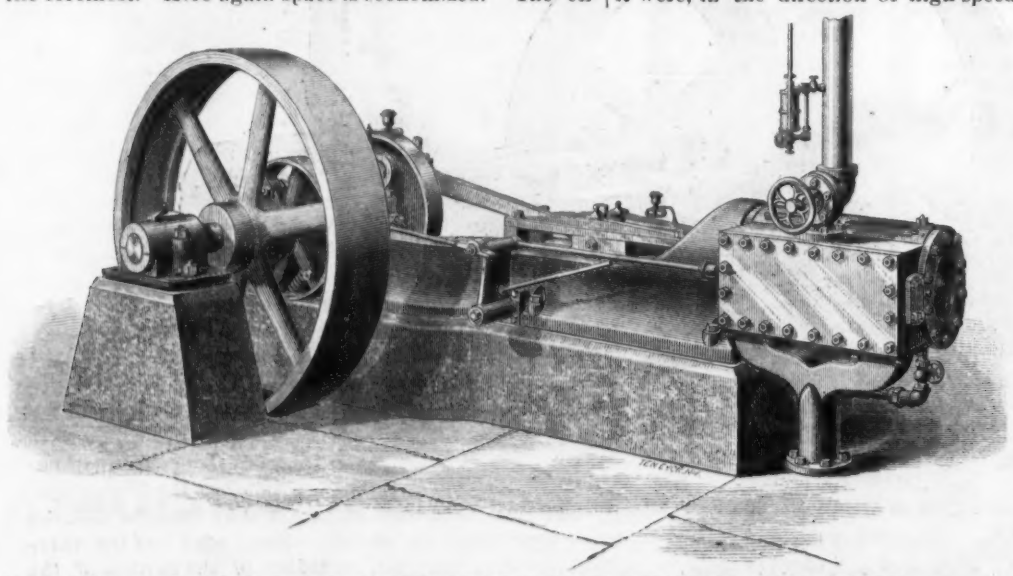

FIG. 4.—LARGE TYPE ARMINGTON & SIMS ENGINE.—BACK VIEW.

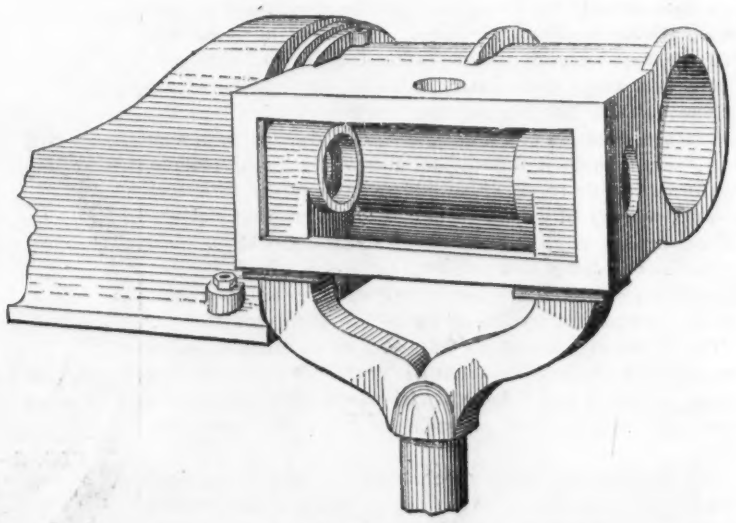

FIG. 6.

glance at these figures shows that these two bearings are remarkably close to each other, and the weight seems well distributed on both sides of the point where the power is conveyed to the shaft. The shaft itself is made of solid steel, and the bearings are rather large in proportion to the power of the engine in every case, so that the liability to uneven wear is reduced. The cheek-pieces are adjustable, and the least wear can readily be taken up without taking apart. Instead of a crank there are two discs between the bearings, both being connected firmly together by the crank-pin. It is by making these discs thin and by reducing the space between them for the crank-rod that the main bearings can thus be brought so closely together. These discs are "loaded" so as to provide effectual balance for the moving parts. Each end of the shaft carries a balance wheel, which can also be used to belt from. This equalization of weight on either side of crank shaft prevents lateral strain, and with large bearings close to each other, as in this case, is very favorable to high speed.

The cylinder, steam chest and valve seat, Fig. 5, are made from one casting, with valve chest accessible by removing a cover as shown in Fig. 6. This, besides the convenience it affords in construction, permits easy access to these parts to the engineer, in case re-setting is required, or to make repairs. The valve (Fig. 7) is of the hollow piston variety with double ports. This style of valve is rather generally condemned by engineers. It has nearly always failed to give satisfaction whenever used in steam engines,

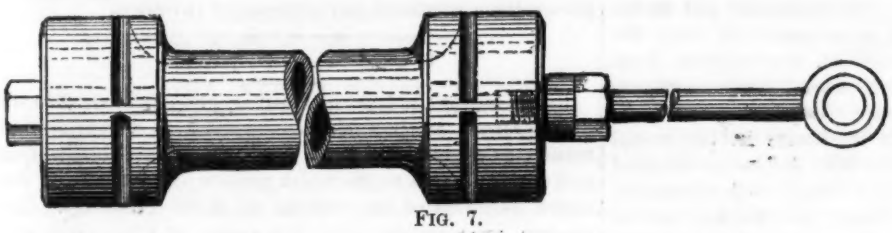

FIG. 7.

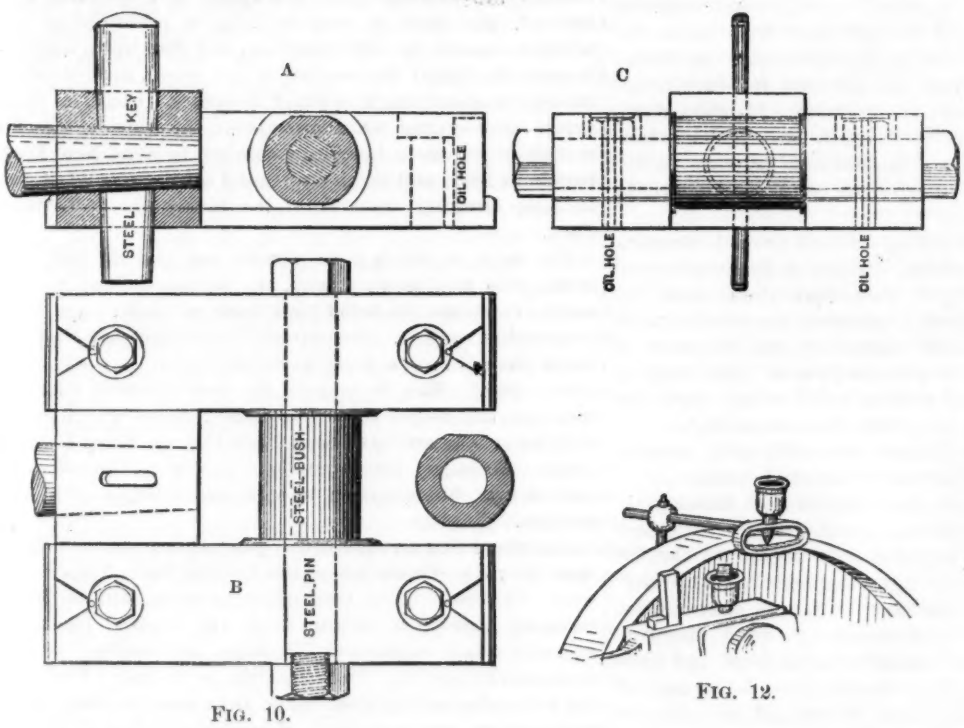

FIG. 10.

FIG. 12.

because of its tendency to leak sooner or later. But Messrs. Armington & Sims have adopted it, as being on the whole the simplest and least liable to get out of order, while it is also the easiest to repair or replace in case it does eventually get out of order, because it can be worked in the lathe. It has now been in use for over two years in many of their engines, and without giving rise to leakage,

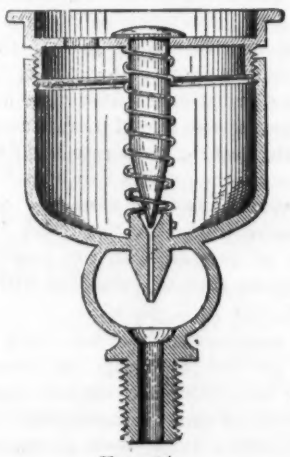

FIG. 11.

which speaks well enough for it. The thick end-portions of the piston valve (*V*, Fig. 5) slide into cylindrical spaces at each end of the steam chest (*S S*), so that the body of the valve itself is entirely surrounded by live steam, and is therefore "balanced." The steam from the valve is admitted into the cylinder ports from the ports on the ends of the valve. In this way the necessity for making the cylinder ports converge toward each other is obviated. They run almost in a direct line into the cylindrical cavity which forms the valve seat, as shown clearly in the figure. From this cavity the steam can pass readily into the exhaust cavities *E E* at either end the moment the enlarged portion of the piston valve moves sufficiently to clear the cylinder port. In the position shown in the figure the right-hand cylinder port connects directly into the exhaust cavity. The valve *V* is just admitting steam into the cylinder port at the other end, at *A* through the ports. *p p* shown by the dark broad lines. The port in the valve

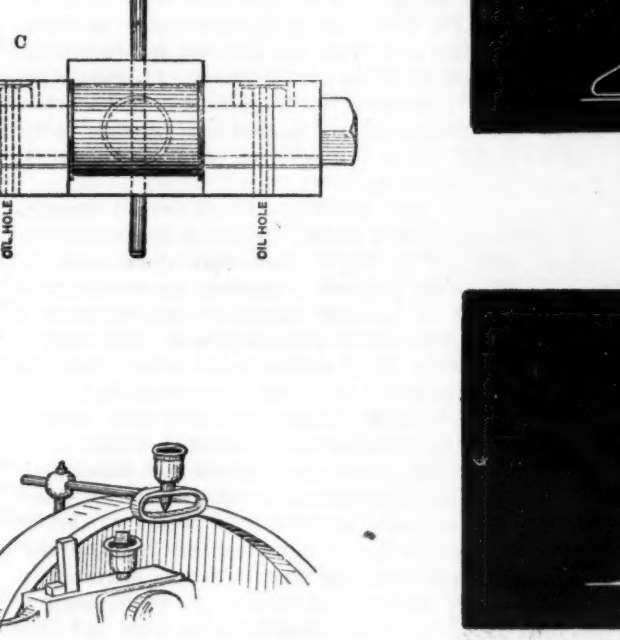

FIG. 9.

at the other end is also just receiving steam from the steam chest, which passes *through* the valve and finds its way into the same cylinder port. In this way the amount of steam admitted into the valve and delivered to the cylinder port is increased and the steam is admitted quickly at the beginning of the stroke of the piston. The makers claim that this valve, as constructed by them, will maintain the supply of steam up to the point of cut off with more certainty than any other. This claim is certainly well justified by the indicator cards obtained from these engines, some of which are reproduced below. They "indicate" perfection itself in the admission line, which is exactly and truly vertical, as well as in the steam line, which is as truly horizontal, while the two corners have a sharpness which will challenge admiration.

The point of cut-off is regulated by the travel of the valve and this is controlled by the governor. This governor, or "automatic cut-off regulator," as it is called, depends on the centrifugal motion of weights, which motion causes a change in the "resultant" excentricity of the excentric that operates the valve, whereby the travel of the valve is modified.

In the Corliss engine, where the speed is slow, the weights take the form of fly-balls, rotating around a vertical spindle, whose speed is multiplied by belting or gearing, but in this case, the speed of the shaft itself is sufficient to insure positive movements and so the weights are made to revolve around it. They are attached to one of the balance wheels. The weights 1, 1 (Fig. 8, 9), are hinged to this wheel, and are controlled by spiral springs that normally press the weights toward the centre of the wheel. The excentric is made double. The outside one *D* slipping on the inner one, is provided with excentric straps to which the valve rod is attached and is connected by a lever (3), with the end of one of the weights. The inner excentric *C* is also free to move on the shaft *B*. It is provided with two ear pieces shown by dotted lines, each of which is connected with one of the weights by an arm (2).

FIG. 13.

FIG. 14.

It is evident that when the speed of the engine shaft is great the weights tend to move by centrifugal force toward the circumference of the wheel in opposition to the springs, until they come in contact with the rim of the wheel. This is one extreme of the action of the regulator (Fig. 8). In this situation the "resultant" excentricity is least of all and the travel of the slide valve is most limited. The result is that the steam is cut off sooner. When the speed slackens, as for instance from increase of load, the weights fall back toward the centre under the influence of the springs, and the motion of the inner excentric with respect to the outer one causes the resultant excentricity to be increased. The valves travel farther, and the point of cut-off is delayed. Steam at full pressure follows the piston for a greater distance, and thus the load is compensated for. The point of cut-off may thus be delayed to seven-tenths of the stroke, The "lead" of the valve itself remains constant, regardless of the motion of the weights. The sensitiveness of this mode of governing is marvelous. It responds to a change of load instantly, and with absolute precision, as has been demonstrated on many occasions in electric-light plants. We regret that we have not space here to detail a few of the experiments made by experts to test this feature of the Armington & Sims engine. In one case the circuit of a dynamo-electric machine feeding forty-one lights was instantly opened, thus removing the whole load, and yet no change of speed was discernible.

(CONTINUED ON PAGE 192.)

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The Dangers of the Arc Light.

IT was long ago established by statistics, though figures are said to lie, that a man runs far more danger in passing along the streets of a city than in spending his nights and days the year round on board railroad cars or in traversing the stormiest seas. Recently, too, the public has been told that the dangers of the streets are greatly increased by the practice of stringing electric wires above the sidewalks, crossing in every direction and surrounding many edifices like a network. When only telegraph wires were used, the practice did not attract so much public attention, but when telephone wires were added, loud complaints were heard, and now that wires for the arc system of electric lighting swing overhead along every sidewalk, the feeling has become general that something by way of improvement, prevention or cure must be tried. It is to this feeling that the rise of so many underground cable companies is due, and if anything were required to fan into flame the public uneasiness and discontent it can certainly be found in such articles as have been published by the *Times* of this city on the last two Sundays. These articles are neither more nor less than a direct and bitter attack on the arc light system, especially in cases where aerial wires are used. They appear under the sensational headings, "Sudden Death in the Air," and "Wires that Burn and Kill," and their general tenor may be judged from the following quotation:

"Conflagration and death are threatened by every inch of the big arc light wires, of which hundreds of thousands of feet are strung up all over the city. They are a constant menace to the lives of those who walk beneath them, and to the permanency of the stately buildings whose architectural beauties they veil and mar. They are liable to kill, with the lightning's suddenness and uncertainty, the fireman who directs a stream of water across them; and, now that means have been found for doubling the time of exposure to their mischievous power by the use of 'storage batteries,' their facilities for slaughter are to be extended to the household, the theatre, the workshop and the church."

This is choice reading for nervous folk, and when it is strengthened in its appeal to fear by about three columns of reported accidents, its effect is probably all that the writer desired.

In the first article, reference is made to the views of an electrical expert of world-wide reputation, who has entirely abandoned experiment with the arc light as hopeless. No great acumen is required to determine that this expert is Mr. Edison, whose dislike of the arc light is matter of common knowledge. The argument put in his mouth by the writer is that it is necessary to work the arc lights by the "series" method, the current from the dynamo passing through each lamp consecutively, so that the pressure required for one lamp is that required for all the lamps in the circuit together. This well-known fact Mr. Edison contrasted with the fact that the incandescent lamps with which his own name is universally associated are worked on the parallel or multiple arc method, so that whereas in the former case, if 40 lamps of 30 volts each were used, the pressure would be 1,200 volts, in the latter case, no matter how many lamps were used, the pressure for each single lamp would only be its own requirement. Mention is also made of the restriction by English law, under which electric light companies are limited to a pressure of 300 volts, for public lights; and referring to the conductivity of water, Mr. Edison says:

"Suppose the man standing on wet ground, grasping with wet hands a metal nozzle, making in this way a connection with an arc light wire somewhere near the dynamo, where the pressure is greatest, the insulation on the wire would be instantly destroyed—for the force of the current is sufficient to pierce a plate of glass half an inch thick—and the death-dealing spark would reach the man and kill him infinitely quicker than thought."

The interview with Mr. Edison closes with some remarks of his, expressing his objections to storage batteries.

Following up this article came another last Sunday, in which the opinions elicited from members of the New York Fire Department were reported with regard to the 500 miles of electric wire for arc lights suspended over the city. Fire Commissioner Van Cott said: "I have always from the very start of this arc light system for street illumination been conscious of the dangers it involved and have been opposed to allowing the wires for it to be strung up as they are all over the city;" and he related how the efforts to secure an ordinance driving the wires underground had failed. Chief Engineer Bates next gave his opinion to the reporter that he didn't see why the arc light wires could not, like the others, go underground, but he also contributed the cheering and wonderful information that, in spite of all these tremendous and imminent dangers to which the firemen were exposed by these illuminating wire, not one of the men had been killed. Chief John Bresnan was likewise able to report a full muster, but from what he narrated it is not a little strange that any member of the service survives to tell the tale.

Allowing for the exaggeration natural in the articles of a reporter, who thinks he has secured a paying assignment and wants to make the most of it, the fact remains that the public mind is in a state of alarm, and has had some ground for its fears. An evidence of the manner in which some people look upon the arc light may be learned from a case heard in the Superior Court, Special Term, this week, although a shrewd suspicion is allowable that the "swelling preludes" of the *Times* were peculiarly timely, and were intended to lead up to this case. Two years ago, Mr. John Tuttle, No. 59 West Twenty-fifth street, on his own behalf, as well as that of his neighbors, brought suit against the Brush Electric Illuminating Company to remove their poles from before his door. He obtained an injunction at first against the company, restraining them from maintaining a pole in front of his house, but it was vacated; and it was not until this week that the case came to trial. Among the witnesses were Mr. E. H. Johnson, the electrical engineer, well known in connection with the Edison Company; Mr. Edison himself; Mr. A. A. Hayes, Secretary of the Brush Co.; Mr. W. H. McGrath, and Mr. F. L. Pope. The evidence drawn out seems to have puzzled the lawyers, but was not particularly new or striking. It went chiefly to establish the admitted fact that when their insulation is defective the arc light wires become very dangerous, and that exposure to the air increases the danger, from the liability of the insulating material to wear out. Mr. Edison gave it as his opinion that the white insulating material used for covering electric light wires is liable to rot, and that the dark material becomes brittle. Evidence was given that in Europe arc light wires are laid underground and operated with satisfaction. The case has not yet been summed up.

We note that a preliminary injunction has been obtained by Mr. Grosvenor F. Lowrey, attorney for Mr. Henry N. Smith, restraining the United States Illuminating Company from erecting a pole and stringing wires in front of lots in Forty-third street, near Fifth avenue, where Mr. Smith is about to build a large apartment house. A motion for the continuance of the injunction was heard by Judge Ingraham, in the Superior Court Chambers (Friday), but we have not yet heard the result. Mr. Ashbel H. Barney also objects to the presence of poles and wires of the United States Illuminating Company in front of his premises, at Park avenue and Thirty-eight street. In a suit brought by him in the Supreme Court, his attorney, Mr. Edward Patterson, has obtained a preliminary injunction against the company.

We cannot help thinking that the public would feel reassured were it to know, as it ought, that the arc light companies are anxious to put their wires underground, and are looking for a system that will enable them to do so. It is not the fault of the companies that hitherto they have been unable to satisfy themselves with respect to the pre-eminent merits of any system yet invented.

Bogus Cable Dispatches.

BY no means the least interesting chapter in the history of literature is that which comprises its forgeries and frauds, going back to a very early period of civilization and coming down to the latest times when journalism has added its quota of impositions on public credulity. Our readers are familiar with the stories of Chatterton and Ireland, and they do not need to be reminded of the Shapira version of Deuteronomy, the *Sun* hoax with reference to alleged discoveries in the moon, and of other familiar instances such as the "Roorback" hoax, a campaign move against Mr. Polk in 1844; the spurious proclamation of President Lincoln, published by some New York papers in 1864; and the later legend by the *Herald* of the animals breaking loose from the menagerie at Central Park.

The ways in which a newspaper can gull its daily patrons, who run as they read, are numerous, and we are sorry to express the belief that many of them have been thoroughly worked. Sometimes it has happened that the paper has not been a party to the deception, but has itself been "sold." This is in part the case probably with respect to the bogus cable dispatches, about which some striking revelations have been made this week in a London court. To bogus documents and bogus correspondence, domestic or foreign, must now be added bogus cable dispatches.

It appears that an illustrated journal in London alleged that the cable dispatches of the Central News Association were "padded." The Association brought suit for libel, claiming that their treatment of the original messages was only a fair expansion. Perhaps our readers will not share that opinion. The originals, as produced in court, did not make up together more than thirty words. This was watered into a dispatch of over one thousand words. The subject matter of the dispatches, dating from Montreal, was the landing of Lord Lansdowne, and the discovery of a plot to blow him up with dynamite. Thereupon a young sub-editor, fortified with books, files of papers, etc., went to work and elaborated a most thrilling and blood-curdling narrative, telling of "intense excitement" in the Dominion, "startling information" communicated to the Cabinet, "far more than vague hints of danger," and "suspicion of foul intentions on the part of the Invincibles." Later on the scent grows warmer, and the romancer in that London editorial den is "reliably informed" that the police have "unearthed a most diabolical plot directed against the life of Lord Lansdowne." Then it comes to light that "a desperate and fiendish plan was formed to blow up the great Allan liner." The means to be employed were "powerful dynamite machines," made "in the dynamite school in New York." Fancy two or three columns of this stuff in the provincial papers of England, filling the soul of John Bull with fury and consternation!

In whatever manner this libel suit may be decided, it suggests one or two thoughts as it stands. "Special cables" of this description are not new, indeed the managers of the Association asserted that wicked American papers could beat him hollow at his own game, and make two columns of a brief dispatch where he would only make one. Still, it is a revelation to the English public of the extent to which they may be deceived, and we imagine that many of the subscribing newspapers will not relish the exposure of the methods of the Association. As for American papers, they have always been more noted for liberal expenditure on telegraphy than their European contemporaries, and there are several that devote large sums every week to the cabling of special correspondence from London, Paris, Berlin and other cities beyond the Atlantic. The example set by the

New York *Herald* years ago in paying not less, we think, than $5,000 for the cabled report of a prize fight, has been variously and freely followed by great journals all over the country. The chief point to be noticed is that each reduction in rates has led to an increase of "press matter" passing over the cables. Should rates go lower, as the public is promised will be the case when the Mackey-Bennett and other new cables are in working order, newspaper readers here and in Europe will be saved from the infliction of such bogus dispatches as this suit has exposed.

Another view of this incident is that it shows up the Association in the light of a wanton disturber of the public peace. As though the bad feeling that exists between large numbers of Irishmen and Englishmen were not sufficiently intense, the two islands are agitated in this shamefuly gratuitous way. We do not wonder that at a meeting of the Quebec branch of the Irish National League on the 13th, attention was called to "the slanderous reports" of a plot against Lord Lansdowne, telegraphed to England and then dished up as a mess of horrors for unsuspecting millions who read only cheap newspapers. The liberty of the press is a blessing not to be lightly tampered with, but offences of this nature ought to be punished.

The journal in question, *Judy*, has been held for trial, but the *Sportsman*, against which a similar charge for a like offence was brought, has had better luck, the summons in the libel suit being dismissed after a further hearing. The plaintiffs threaten, however, to prosecute the *Sportsman* again.

The Work of the Journalist.

Those connected with the editorial department of a carefully and conscientiously conducted newspaper or journal occasionally find themselves asking this question: How many readers ever stop to think of the labor involved in preparing the matter for even one issue of a paper? When one looks at the bright and inviting pages, giving the news and happenings from all parts of the globe; the handsome cuts showing to perfection some important new devices, and reads the pithy editorial comment on passing events, he says, That is a splendid "paper," but rarely thinks of those who spend their days and nights in making it what it is. Few who have not had actual practical experience can appreciate how much work—how much real, downright hard work—has to be done before a journal that takes pride in being what it professes to be is ready for the eye of the reader. It is easy enough to steal articles from other papers and palm them off as one's own; to put in whatever comes to your hand, without troubling yourself or using any judgment as to what should be published and what not; but every journalist worthy of the name takes too much pride in his work to do that, He wants what he writes to be original, and he feels that he cannot put too much work upon it—the best is not too good for his readers. This involves many a headache—many an hour of patient, painstaking, thoughtful application, when both body and brain are worn out and need rest; but the approach of the inexorable "publication day" leaves him no alternative. The paper *must* go to press; thousands of readers are expecting it, and the matter will have to be ready in time.

The reading and study one has often to do to familiarize himself so thoroughly with a particular subject that he can explain it intelligently to others is well exemplified in the case of the article on Engines for Electric Lighting in the present issue. The writer of the article has employed his spare time for the past three months in "reading up" the theory and in acquainting himself with the practical details of steam engineering. He believes, however, that he is now qualified to write a series of articles on this important subject that will do credit to both the author and the paper. He feels that he can explain the principles involved so clearly and in such simple and easy language that any intelligent reader can grasp them without difficulty. To treat the subject in this way is his aim in everything he writes, and the aim of THE ELECTRICAL WORLD in everything it publishes.

A perusal of the article referred to, in another column, will demonstrate whether or not this belief is well founded. The article in to-day's issue is only one of the series of special original illustrated articles from the same pen that have appeared in every issue of THE ELECTRICAL WORLD since and including last August.

Relative Cost of Electric Light and of Gas.

The Rhode Island Electric Lighting Company of Providence publishes a letter by Grant Brothers, of Olneyville, R. I., giving their experience with the incandescent lights (Maxim system) furnished by the company and the cost of the electric light as compared with gas. Grant Brothers say they have had 167 lamps in use for six months, from April to October—say 1,460 hours in actual use. The power is furnished by the Corliss engine, which drives the looms, the indicated horse-power being 50 without the electric machines and 73 with the machines running. The lamps were guaranteed for an average life of 600 hours. Omitting 20 broken in starting the machine and 7 imperfect ones returned for new ones, the number of lamps broken in April was 9; May, 8; June, 7; July, 9; August, 10; September, 9; to Oct. 15, 8; total, 60.

A breakage of 10 per month, as above, continues the letter, if continued indefinitely in the future, would indicate an average life of nearly 17 months– say 4,000 hours. This we do not expect, but think we are safe in counting upon an average breakage of not over 18 per month of 243 hours, giving a life of 9 months, or 2,200 hours.

Assuming the life of the lamps as 2,200 hours, we have as the cost of lamps per year of 3,360 hours an equivalent of 255 lamps, at $1.50 each	$382.50
Attendance, 1 man, at $9 per week	468.00
Fifteen per cent. on cost of machines, shafting, belts, etc. ($4,328)	649.20
Oil, brushes and sundry supplies, estimated	130.00
23 H. P., at $1\frac{35}{100}$ cents per H. P. per hour, for 3,360 hours	966.00
	$2,595.70
Cost of gas, 167 seven-feet burners, 3,360 hours, 3,927,840 feet gas, at $2 per M	$7,855.68
In Providence we should be allowed a rebate on this quantity of gas, say 25 cents per thousand feet	
Cost of electric lighting $\frac{12}{100}$ of 1 cent per lamp per hour, equivalent to gas at 66 cents per thousand feet.	
In our case we estimate the difference of cost per annum at not over	$500.00
Adding this to attendance, lamps and supplies, as above	980.50
And 6 per cent. for interest on plant	259.68
We have	$1,740.18

which may be regarded as the actual cost per annum so far. To this should be added a depreciation account, say of 8 per cent., $346.24; or a total of $2,086.42, which we believe to be a close estimate of the cost to us of 107 lamps, running or burning 3,360 hours per year, or $\frac{8}{10}$ cents per lamp per hour, equivalent to gas at 53 cents per thousand feet.

The People's Telephone Co.

At the adjourned annual meeting in this city on the 8th, of the People's Telephone Company, the attorneys of the corporation reported that during the past year they have made excellent progress in proving Drawbaugh to have been the first inventor of the telephone, and that he never abandoned his invention, but, on the contrary, has been diligently working all the while to perfect the same. Judge Hill, the chief solicitor of the claimants, concerning the proceedings now pending in Harrisburg, Penn., where witnesses are now being examined in sur-rebuttal, stated that the evidence thus far taken strengthens the original testimony in many particulars, and also denies and refutes the rebutting testimony of tho opposing counsel. The treasurer's report shows cash receipts of $83,880 and disbursements of $55,343 for the year; assets, $4,364,827. These do not include the value of the ownership of patents, patent rights, machinery, tools and material belonging to the company. The company has no indebtedness whatever. Mr. Drawbaugh has been constantly at work perfecting his telephones, and has invented and constructed instruments of wonderful execution, for which the following patents have been issued or are pending in the Patent Office: October 31, 1882, amplifying instrument; October 23, 1882, transmitter; April 17, 1883, two transmitters; February 27, 1883, repeater. The following additional patents have been allowed, but are not yet issued: October 25, 1883, receiver; and for transmitters on June 9 and 26 and August 1, 1883. New applications are now pending for an induction coil and no less than eight transmitters, exclusive of those already included. The old applications of the original case filed June 26, 1880, comprise, under divisions B, C, D, E, and F, the underlying claims for every known device for receivers, transmitters and signaling instruments. Foreign patents have been secured in England, France, Germany and Belgium.

The Infancy of Electric Light.

It is not easy to remember how many years have passed since the earlier experiments in public with electric lights, and how many difficulties have been found in the way of their practical use, after sanguine inventors have been quite sure of success.

The following letter, with the heading here given to it, was published in a London journal about forty years ago, in the autumn of 1843:

GASLIGHT SUPERSEDED BY ELECTRICITY.

A letter from Paris dated October 21 [1843] gives the following interesting account of the first public trial of an experiment which has been more than four years in preparation, for fixing at a given point the electric fluid, and making it applicable to the purpose of lighting the streets and private houses. On one of the bases of the statues called the Pavillion de Lille, on the Place de la Concorde, a glass globe of apparently 12 or 13 inches in diameter, with a movable reflector, was fixed in connection with a voltaic battery, and at a little before nine o'clock the electric fluid was thrown into it by a conductor. At this time all the gaslights of the place, about 100 in number, were burning. As soon as the electric light appeared the nearest gaslights had the same dull, thick and heavy appearance as oil-lamps have by the side of gas; soon afterward the gaslights were extinguished, and the electric light shone forth in all its brilliancy. Within 100 yards of the light it was easy to read the smallest print; it was, in fact, as light as day. The astonishment of the assembled multitude was very great, and their delight as strong as their astonishment. The estimate made by the scientific persons who were present was that the electric light was equal to 20 of the gas lamps, and, consequently, that five of those lights would suffice to light the whole place most brilliantly. As regards the expense of production, nothing positive has transpired, but I think I may safely assume that it would be considerably less than that of the generation of gas, while the first outlay for machinery and conductors would not amount to a twentieth part of that required for gas works. There would also be another great advantage in the electric light. It gives out no bad smell; it emits none of those elements which, in the burning of gas, are so injurious to health, and explosion would be impossible. The only danger that would arise would be at the battery itself, but that would be at the control of competent persons; and even in this respect there would be no danger, even to unskillful persons, with an apparatus of moderate size. Internal lighting would be as practicable as external lighting, for by conductors the fluid would be conducted to every part of the house. The experiment performed last night was with a voltaic battery of 200 pairs composed as follows: First, an outer globe of glass; secondly, in this globe a cylinder of charcoal, open at both ends, and plunged in the nitric acid contained in the outer globe; thirdly in the cylinder of amalgam of zinc plunged in acidulated water (with sulphuric acid). This replaces the cloth in the common battery; fourthly, in the porcelain vase cylinder of amalgam of zinc plunged in acidulated water. The pile was on the Pavilion de Lille; the two copper conductors from the two poles, are pointed with charcoal, and lead to an empty globe from which the air has been exhausted. The two fluids, on meeting, produce a soft but intense light. I understand that the experiment was considered highly successful by the authorities who were present, and it is to be repeated on a large scale. Should the thing work as well in a general way as it did last night, and the cost be less than that of gas, which it must be, there will be a dreadful revolution in gas works. I have heard it asserted by persons who are acquainted with Mr. Achereau, the gentleman who performed the experiment last night, that a company for the supply of the electric light would realize a handsome profit on charging only a sixth of what is now paid for gas. The strength of the electric light did not appear to me to exceed that of the hydro-oxygen; but it is much more simple in the apparatus required, and much less costly in the expense of production. The hydro-oxygen light requires a double and most expensive apparatus, and is only applicable to a few localities; the electric light may be applied externally and internally in any place.

Fire Alarm Priority.

To the Editor of The Electrical World:

SIR: Still another voice, this time from Saratoga, N. Y. As the order of the day seems to be the claiming of the introduction of the fire alarm telephone system, we would like to put in our claim for the summer of 1882, introducing the system in Dover, N. H. Please allow the honor to remain with H. T. Downs until some one *downs* 1882.

SARATOGA SPRINGS, N. Y., Nov. 9, 1883. *

To the Editor of The Electrical World:

SIR: The voice of Mr. C. W. Foster, from Galveston, Texas, has been heard in Worcester, Mass., through your issue of Nov. 3, 1883. It is in regard to "Telephone Fire Alarms." Credit was given, as he says, in your issue of Oct. 13, to the North Pennsylvania Telephone Co. for the first practical inauguration of the so-called "telephone fire-alarm system." Mr. Foster claims for the "Southwestern Telephone Co." the credit for the same thing in Houston, Texas.

In Worcester, Mass., the same arangement has been in use since *June* or *July*, 1879. All the engine-houses are connected from the central office, *on one wire*, by telephone, each engine-house having a regular station, and all arranged so each engine-house can loop into circuit by simply taking down the receiver. We also have a separate instrument on that circuit in the main office. Upon being notified by telephone of a fire anywhere in the city, two blows are struck by means of an automatic circuit breaker upon the fire-alarm bells, each engine-house having such a bell. Upon hearing the two blows a man instantly takes down the receiver at each engine-house, and by means of the instrument referred to at the central office, as being always connected with the line, every engine-house is told *instantly* the exact location of the fire.

The arrangement is very much appreciated here in Worcester, and has the advantage that the fire department is not annoyed by such a mob at the fire as would result if a regular fire-alarm box were struck, and so indicate to all the street loafers the location of the fire, and bring them there, to the great annoyance of the fire department.

We claim the originality of the arrangement, and do not know of but one other place similarly equipped, that place being Lowell, Mass., which was copied from Worcester. E. M. WILSON, Supt. Worc. Ex.

WORCESTER, Mass., Nov. 9, 1883.

LESS EXPENSIVE THAN PRESENTS.—When a New York lady was married in London the other day, over ten cable messages of congratulation were sent from New York. This is less expensive than buying bronzes and silverware.

(CONTINUED FROM PAGE 189.)

On connecting the wires, so as to throw on the load again instantly, the engine compassed it without showing the least disturbance from the "even tenor of its way." The actual fluctuation produced in the speed probably did not exceed two per cent. of the number of revolutions per minute. No doubt much of the excellent reputation which this engine enjoys is ascribable to the perfection of this regulator which presents the great merits of simplicity.

FIG. 15.

It is not liable to get out of order, and above all it is not likely to let the engine "run away," a circumstance which occasionally occurs with the old-fashioned fly-ball device, from the breaking of the governor belt or other cause.

The piston is hollow, securely fastened by a taper fit to the rod, and is furnished with two snap rings, which the makers find the best for service. The cross-head (Fig. 10) is made of cast iron with large wearing surfaces. There are gibs on the bottom which can be set out to any extent if wear takes place. The piston-rod is fastened with a steel key.

The wrist-pin is a steel bushing flattened on the upper and lower surface as shown in the upper sectional view. This steel bushing is held in place by a steel bolt passing from side to side.

The means provided for lubrication are very simple and effective. For the cross heads the oil passing from the oil cups on the slides is distributed over the under surface of upper slide. A part of this oil is gathered by *V* shaped depression at each end of the upper surface of the cross-head (shown in lower part of diagram). At the point of the *V* is a small hole which conducts the oil to the lower slide where the motion distributes it. The oil cups used for the slide valves and also for the main bearings are shown in Fig. 11. As will be understood the supply of oil is regulated by screwing or unscrewing the cover and moving the plug in or out of the drip hole the lower end of which is visible and enables the rate of feed to be determined and adjusted at will. For oiling the crank, and wrist pins, an arrangement like that shown in Fig. 12 is used. The cup is mounted on a bracket and the oil drips upon a strip of lamp wick which droops down just low enough to permit the tip of the oil cup on the connecting rod to wipe away a drop of oil at each stroke. The device used for oiling the excentric strap is of this nature, also. The efficacy of these oiling devices is well demonstrated by the fact that they render possible a continuous run of several days and even weeks. One of the tests to which Mr. Edison subjected one of the Armington & Sims engines before adopting them for his Pearl Street station was to run it without stopping for nearly seventeen days. "The proof of the pudding is in the eating," says the proverb, but the proof of a good steam engine is—a good indicator card. As evidence of the perfect adaptation of design and skilled workmanship that characterize the Armington & Sims engines we present a few of the indicator cards taken from different sizes of the Armington & Sims engine. Fig. 13 is a *fac simile* of a card taken from engine No. 1,364, coupled to one of Mr. Edison's large dynamos. Cylinder 12 × 12 inches. Main area of piston, 111 square inches. Speed, 350 revolutions. Mean pressure, 45.28 lbs. Indicated H. P., 106.6. The admission and steam lines are perfect. The expansion line forms a very smooth curve. The "cushion" curve is rather larger than is ordinarily the case. Now this is one of the pecularities of these engines. Fig. 14 shows a diagram from engine No. 1,451, in which the compression or cushion curve rises nearly to the height of the steam line which, by the way, is quite short, showing that the cut off was at an early part of the stroke. The power developed was evidently small The data are: Speed, 300; cylinder, 8½ ×10; area of piston, 56.18 square inches; mean pressure, 18.06 lbs.; indicated horse power, 15.3. Now let us compare this with another card (Fig. 15) from the same engine at the same speed. Mean pressure 42.58 lbs. (indicated H. P. 36.2). These two cards show very clearly the effect of increased load. The cut-off occurs much later, being delayed over twice as long, and the compression begins likewise twice later and does not rise to the same height by half. The result may be expressed by saying that the expansion and compression vary *together* and in inverse proportion with the load. This peculiar result of course depends on the valve motion relatively to the cylinder ports.

We are of the opinion that much of the sensitiveness of regulation characteristic of this engine is due to this peculiar coincident relation between expansion and compression. Let us suppose that the load is suddenly thrown off at the *beginning* of a stroke. What happens? Instead of cutting off at quarter stroke, the cut-off will occur sooner. But even admitting that the weights do not fly outward until the stroke is ended. On the return the compression will begin early, and the cushion pressure will be very great. Now this pressure evidently cushions or dampens the motion of the piston. Moreover while the cushion on the exhaust side is great, the expansion on the other side of the piston is also great, in consequence of early cut-off, and thus there are two causes which combine to retard the motion. On the other hand, the sudden increase of the load would act so as to "expand" the indicator card, by causing both the expansion line and the compression line to shorten.

It might be thought that the compression of the steam in the exhaust side of the cylinder would absorb energy uselessly, but such is not the case. The compression simply stores power just as if a spring were compressed, and with a small amount of fresh steam it is enabled to produce a second stroke.

Fig. 16, is copied by permission from "*Twenty Years with the Indicator*," by Thomas Pray, Jr., a celebrated expert in engineering matters. The diagram which is taken from an Armington & Sims engine running almost without load shows in an interesting manner the way in which the expansion and compression lines approach as the load diminishes in this engine. We regret exceedingly that we cannot here reproduce the comments of Mr. Pray on the "moral" which these indicator cards convey in regard to the problem of steam engineering and the appreciation of the merits of these engines which they call forth.

In conclusion we would state that the Armington & Sims engine is now manufactured in France, under the supervision of American foremen. Its performance everywhere elicits so much praise that it is likely arrangements will be made for its manufacture in other countries also.

Another Successful Spiral Wire Test.

Mr. Alex. R. Benton, general manager of the American Spiral Telephone Wire Company of Boston, writes, under date of Nov. 13, as follows.

FIG. 16.

"We take pleasure in being able to inform you of the success of our long test line to Manchester and Concord, N H. On Saturday last we made a test from our offices in this city to Lowell, Manchester and Concord, in all 84 miles of wire, one wire running through four cities, and six telephones and signals, also switches. We had a party of gentlemen at each station, and all expressed themselves as surprised when we talked in the lowest voice from this city to Manchester and Concord. Our conversation from this city to Concord is as clear, and could be understood as well, as if you were in the same room. This line is strung with No. 13 wire."

We find in the Boston papers appreciative notices regarding the success of the test. The Manchester *Union* of Nov. 12, referring to the test, says that the wire "worked to a charm. Its superiority lies in clearer articulation for long and short distances, and less induction and leakage than can be found in other lines. It promises to become the universal wire, and already many of the leading companies are adopting its use."

Electric Lights set Gas on Fire.

An automatic fire-alarm sounded at 6:10 o'clock on the evening of the 12th, from the store of Rogers, Peet & Co., No. 569 Broadway. When the firemen arrived the fire was out, and their services were not required. The cause of the alarm was the ignition of an accumulation of gas in the show-window of the firm at Prince street and Broadway. While rearranging the wires connected with the dynamo by which the electric lights in the store are supplied, a row of gas jets running around the top of the window were lighted, and were burning for about two hours. At 6 o'clock the electric lights were started, and the gas in the show-window was turned out. Ten minutes later there was a puff of fire in the window, which cracked one of the plate-glass panes and set fire to some of the goods. The current of electricity was switched off and the fire extinguished with a pail of water. The rise of temperature in the window had set off the automatic alarm, and the street alarm was sent by some one in the hotel. The damage by the fire was very slight. It is believed that a quantity of gas which had escaped from a leaking pipe and had accumulated in the window after the lights were put out ignited from the electric light and caused the fire.

Electrical Marionettes.

An electrical discovery has been made which promises to revolutionize the whole art of acting and to make the stage a perfect picture of life. It has been found that the electrode, when brought in contact with various nerves of the human system, produces facial contortions, in one case simulating fear, in another disgust, and so on through the entire range of expression. Photographs illustrating thi wonderful discovery were exhibited at the recent Munich Exhibition.

The application of this to the stage is manifest. The stage manager or prompter will sit within sight of the actors and with insight into their facial necessities. Electrodes carefully fitted to the nervous systems of each actor will be connected by wires to a key-board in front of the manager, who will press the little knobs as he may wish to illustrate the various passions of the human heart. It will require some judgment and knowledge, but the expense of hiring ten competent tragedians or comedians might be saved by substituting nine "sticks" to be vivified by one well-paid prompter.

Liveliness of action might be introduced by carrying the system still further and applying the electrodes to the arms and legs of the actors. The irate father could then kick his daughter's suitor down stairs with appalling realism, and a fight among the supes could be made lively and interesting.

Nay more, electrodes could be fastened to the arms of the chairs in the auditorium in such a way as to communicate to the average "funny bone" in each spectator's elbow, and when an actor made a joke, the audience could thus be made not only to see it, but to explode in simultaneous cachination.

This invention is to be earnestly commended, not only to certain actresses and actors whom we will not be so unkind as to mention, but also to the managers of certain negro minstrels and spectacular dramas whose jokes have become threadbare and need galvanizing, like the dead frog. The world is progressing.—*Philadelphia Press.*

Electric Lights in Theatres.

There was quite a scare in one of the theatres in this city, the Third Avenue (McKee Rankin's), a few nights ago, partly in consequence of a cry of fire, but chiefly from another cause. The Third Avenue is the only theatre that has as yet adopted the electric light. It is the only light used, either on the stage or in the auditorium. Now, the electric light has an unpleasant trick of going out quite suddenly now and then, leaving in a sort of Cimmerian darkness the place it should illuminate. It played that trick in the Third Avenue Theatre the night in question, the audience got frightened and turned toward the doors, some mischievous person raised a cry of fire, and there came very near being a dangerous panic. The lights blazed up again in a moment, however, and the scare passed off. As it works in the Third Avenue, the electric light is hardly a success. The chief objection is that it cannot be turned down or moderated in any way. When Clara Morris was playing *Camille* there a few weeks ago, a rather comical sort of contretemps was noticed. The time was supposed to be near midnight. *Armand* entered and called for a light, and a servant brought in a lamp and set it before him. At that very moment and all through the scene the electric lights in front and on the stage were burning brilliantly, and the flame of the lamp seemed like a candle in the sunlight. The absurdity of it almost spoiled the scene.—*N. Y. Correspondence Detroit Free Press.*

THE ELECTRIC LIGHT.

ROME, GA.—The cotton factory at this place is hereafter to be illuminated by the electric light!

SYRACUSE. N. Y.—Syracuse, N. Y., is to have a 100-light Thomson-Houston plant, capable of increase to 400 lights.

WASTED CARBON.—The lost carbon in London smoke is estimated to be worth $25,000,000 a year.

ANOTHER WESTERN COMPANY.—The Globe Electric Light and Power Company has been organized in Chicago, with a capital of $600,000.

QUINCY, ILL.—The Elm City Electric Light & Power Co. has been incorporated with capital stock of $40,000, to operate at Quincy, Ill.

RAHWAY, N. J.—The United Globe Electric Light Company have secured the contract to furnish a plant of fifty arc lights at Rahway, N. J.

BALTIMORE'S ELECTRIC LIGHT BILL.—The city comptroller of Baltimore has drawn a warrant for $14,490 to pay for electric light during the quarter ending October 31.

PROVIDENCE, R. I.—The R. I. Company reports doing a good business and has three mills under way for about 800 lights. The station is doing well and increasing every day.

AT FALL RIVER, MASS.—The Fall River Electric Light Co. using the Thomson-Houston system, are to have a new Armington & Sims engine of greater capacity than the present one.

WILLARD'S ARC LAMP.—A new electric arc lamp, invented by F. L. Willard, the novelty of which is the device for controlling the movement of the carbon, has been on exhibition in London.

WHAT MAKES IT FLICKER?—Savannah people are not satisfied with the statement of the contractors that it is the jarring of the street cars which makes the electric light flicker and bob up and down so.

MEXICAN PATRONAGE.—Oaxaca, Mexico, has the electric light, and the lamps at Merida were first lighted on the 7th ultimo successfully. Guanajuato has added 20 lamps to the installation on the principal plaza.

CHOOSING THE CUMMER ENGINE.—The Underground Electric Light Co., Philadelphia, Pa., have sent in their order for a pair of Cummer engines, 350 horse-power, to drive their new system of electric lighting.

THE FITCHBURG, MASS., STEAM ENGINE CO.—This company have recently supplied the Massachusetts Electric Light Co. of Fitchburg with a pair of 75 horse-power engines and a 150 horse-power boiler; and the Salem, Mass., Electric Light Co with a 75 horse-power engine.

PACIFIC MILLS, LAWRENCE, MASS.—The Pacific Mills, Lawrence, Mass., have decided to introduce incandescent electric lighting. The New England Weston Company have the contract and are laying the wires for a six hundred lamp Maxim plant.

KEENE, N. H.—The Merchants' Electric Light Company have obtained permission from the City Council to erect and maintain an electrical light station. The expense will be 65 cents a light per night. Several merchants have agreed to use the lights.

THE MERRICK MILLS, HOLYOKE, MASS.—The Merrick thread company have decided to double the capacity of the Edison incandescent electric-light plant in their Appleton street mill. It now affords 350 half lights, and these will be changed to whole lights.

PUTTING THE WIRES UNDER GROUND.—The Brush Electric Light Company, of Philadelphia, is preparing to put its wires on Delaware avenue under ground. The company has been required to enter bonds, in the amount of $20,000, to keep the avenue in repair.

A USE FOR TURBINES.—Aurora, Ill., and Ogden, Utah, are lighted by electric lamps, the power used being that of waterfalls. An electric lighting company proposes to utilize the power of the Genesee Falls at Rochester, N, Y. and is putting in turbine wheels for the purpose.

MAUCH CHUNK IN DARKNESS.—There is an opening for an enterprising electric light company at Mauch Chunk, Pa., the gas works at that place having been destroyed by fire on the 6th inst., leaving the streets in total darkness, with no prospect of gas for many days.

WAR IN PROVIDENCE, R. I.—An electric light war is said to be in progress at Providence, R. I., between the Weston Company, which has some 200 lights in operation, and the American Electric and Illuminating Company of this city, which has just put in a 200-light Thomson-Houston plant. A hearing will be given by a special committee of the City Councils.

THE NEW ENGLAND WESTON CO.'S OPERATIONS.—Among the plants recently installed by the N. E. Weston Company has been one of 75 Maxim incandescent lights at the works of the South Boston Cooperage Company; 400 Maxim lights operated by two 200-light dynamos, at Nourse Mill, Woonsocket, R. I.; 44 arc lights at the Renfrew Manufacturing Company, Adams, Mass.

NO MORE KEROSENE FOR EL PASO.—A Brush-Swan electric light company has been organized at El Paso (Texas), with ample capital subscribed, and the *Daily Times*, of that place, remarks jubilantly: "In the near future, the dark, unlighted streets will cease to inspire terror on moonless nights, and the fragrant kerosene will no longer be a necessary evil."

CAPACITY OF LARGE EDISON DYNAMOS.—In our leading article on large dynamos, in the issue of Nov. 3, the capacity of the Edison steam dynamo, was owing to a typographical error, stated to be 24,000 lights of eight candle power, or 12,000 of sixteen candles. As most readers interested in the subject doubtless saw at the time, this was a mistake. It should have been 2,400 and 1,200 respectively.

A NEW INCANDESCENT LAMP.—M. P. Tihou has shown a new incandescent lamp to the Industrial Society of Lyons, France. A chalk rod is interposed between the carbon points of an arc lamp, and serves to maintain the arc, while it is itself heated to incandescence, giving off an increased light, which does not vary as quickly as the current which feeds the lamps, and thus serves to keep the illumination steady.

BOSTON'S BRILLIANCY ACCOUNTED FOR.—There are upward of 360 electric lamps employed in lighting Boston streets at a cost of 6 cents per night. They are lighted half an hour later in the evening than the street lamps and burn half an hour later in the morning. The average displacement of street lamps by each electric light is three and one-quarter lamps, which for 369 electric lights would make a total of 1,199½ street lamps that have been displaced by electric lights.

THE ARNOUX COMPANY IN CLEVELAND.—The Arnoux Electric Lighting Company, of Cleveland, has been granted permission to erect poles in the streets of that city, the city reserving the right to grant to any other person, individual or individuals, company or corporations, the right and power to use the poles and other fixtures so erected. The company is building a lighting station on Johnson street. Among its equipments will be two large engines.

THE UNITED GLOBE ELECTRIC LIGHT COMPANY have purchased the patents and plant of the Cutter Electric Light Company, of this city, and also the company's plant in Allegheny City, located in the yards of the Pittsburgh, Fort Wayne, and Chicago Railroad Company. They are now negotiating with the Pennsylvania Railroad Company to light all their principal stations between Pittsburgh and Chicago.

AN ALLEGED PERFECT INSULATOR.—In reference to the local article of yesterday, says a recent *Commercial Gazette* of Cincinnati, calling attention to the great danger from electric light wires in wet weather, a gentleman affirms that a most perfect insulator is soap-stone, or silicate of magnesia, a Cincinnati invention, and now being manufactured here. The broad claim is made that it is absolutely proof against the most severe heat, rain or any kind of weather, being a perfect non-conductor under all conditions.

THE light furnished for the initial experiment at Philadelphia, Oct. 13, was supplied by the Underground Electric Light and Power Company, a corporation that simply uses the conduits as a vehicle for carrying its wires. It uses the system of the Excelsior Company of New York. The supply station of the company in Philadelphia is at No. 123 South Eleventh street, where 600 arc lights are to be stationed. The Underground Company will continue to lay its conduits until stopped by the frosts.

A NEW THOMSON-HOUSTON COMPANY IN OHIO.—A charter has been granted the Youngstown (O.) Electric Light Company. The corporators are A. W. Jones, Lloyd Booth, Frank Wood, George Margerain and D. B. Stambaugh, the capital stock being fixed at $60,000. The company proposes using the Thomson-Houston light, and will introduce it into business houses, residences, manufacturing establishments, and for lighting the city. The gentlemen interested have visited other cities in the State where it is in use, and say that in their judgment it can be furnished cheaper than gas.

THE SPERRY CO. OF TORONTO, CAN.—Application ha been made for the incorporation of the Sperry Electric Light and Motor Company of Toronto, to acquire patents, patent-rights, and inventions creating light and power by means of electricity, and to manufacture and erect machinery, plant, etc., for that purpose. The capital stock of the company is $400,000. The names of the applicants are: Alexander Manning, Hermon H. Cook, Edward Gurney, Jr., David S. Keith, John E. Rose, all of Toronto; Lawrence J. Fitzgerald, of New York, Manufacturer; Elmer A. Sperry, Chicago, Illinois, Electrician; and Cyrenius M. Greene, of Chicago.

THEY DON'T WANT GAS.—A resolution was put through the Councils of Cincinnati in great haste, last week, to light all the improved streets of Eden Park with gas. The park has been the scene of many outrages after dark. When the citizens of Walnut Hills learned of the action of the Councils, much indignation was expressed, and a petition was circulated, which received many signatures, setting forth "the desirability of amply lighting said park with electricity, as is being done in other cities, thereby adding greatly to the comfort and safety of those who are obliged to traverse said place after dark." It is probable that the Councils will reconsider their action.

COREANS EXAMINING THE ELECTRIC LIGHT.—On Wednesday afternoon the four remaining members of the Corean Embassy paid a visit to the United States Electric Lighting Company works at Newark, N. J. They were accompanied by Mr. Hebard, President of the company, and a car was placed at their disposal by the Superintendent of the Delaware, Lackawanna and Western Railroad. The Coreans were initiated into the manufacture of electricity from the beginning to the end. They inspected the testing machines and lamps ander Mr. Weston's charge.

LITTLE ROCK LIGHTED.—Last night, says the Little Rock, Ark., *Daily Gazette*, of recent date, the first trial of the Brush electric light was made in the business houses along Markham and Main streets. There were no false attempts, and everything worked smoothly as if we had been accustomed to the brilliancy of the mysterious illuminator. The pure and white lights made every object distinctly visible for a great distance, and the gas lamps paled into feeble insignificance beside it. The streets were crowded with visitors, who were outspoken in their praise of the Brush illuminator. A very prosperous Brush company has been organized in Little Rock, and other Arkansas cities will follow its example.

THE Westinghouse Machine Company, of Pittsburgh, report a remarkable activity in the demand for their automatic engine. During the month of October they manufactured and shipped a total of seventy-three engines, representing a product of nearly $50,000. Their new orders during the same month aggregated over 2,000 horse power. Among the prominent orders were The New York & Brooklyn Electric Light Co., four engines of 50 H. P. each; The Arnoux Electric Light Co., of Cleveland, two of 65 H. P.; The Brush Electric Light & Power Co., of Savannah, two of 50 H. P.; The Butte Electric Light Co., Butte, Montana, two of 50 H. P.; The Brush-Swan Electric Light Co., of Cheyenne, 65 H. P.; The Brush Electric Light Co., of Buffalo, 50 H. P.; The Electric Light Co., of Decatur, Ill., 50 H. P.

THE LIGHT IN MAINE.—Electrical lighting is to speedily become an established fact in Lewiston and Auburn, Me. A long and stormy session of the Lewiston city government on Thursday evening, the 8th, granted the petition of the Consolidated Electric Light Company of Maine, using the Thomson-Houston system, for right to establish a plant and pole lines, in the face of a strong opposition from a rival company, and similar action has been taken by the Auburn board. Work will begin at once. A local board of directors has been chosen, consisting of the Hon. E. F. Packer, president of First National Bank; C. J. Parker, manager of the Bates mills; F. W. Parker, treasurer of Androscoggin Savings Bank; Ara Cushman, G. C. Wing, R. C. Reynolds and H. N. Wagg.

THE SOUTHERN ELECTRIC LIGHT COMPANY.—The certificate of incorporation of this company, whose main purpose is to supply cities and towns in the Southern States with electric lights, was filed in the County Clerk's office, this city, Nov. 15. The capital stock of the new company is $500,000, divided into 5,000 shares of $100 each. Its corporators are William J. Cahoone, Oscar King and Henry C. Elliott, of this city, who, with John C. Calhoun, of Arkansas; James Lingan, of Louisiana; Patrick Calhoun, of Georgia; J. P. Hodgeson, of Texas, and Edward C. Hancock and James H. Shorter, of this State, form its Board of Trustees for the first year of its existence.

THE LIGHT IN KANKAKEE, ILL.—A company with a capital of $8,000 is being organized in Kankakee, Ill., to introduce the electric light in that city. A canvass of the town resulted in placing thirty-two lights, outside of the twelve which the city will probably take. The company proposes to receive bids from the different parent companies and adopt the light which seems to be the most advantageous. A representative of the Jenny Company has already left his figures with the company. Premising that everything moves along without difficulty, it will be about six weeks before the lights will be in operation. Meantime lanterns, violations of the third commandment and bruised shins will continue to be the prevailing fall style in Kankakee.

LIGHT THROUGH WIRES UNDERGROUND.—President Johnstone and his colleagues of the Sectional Underground Conduit, says the Philadelphia *Times* of the 14th, all wore broad smiles last evening as they pointed out to their friends the beautiful light produced by the underground system on Chestnut street. The company has laid its sectional iron conduit on Chestnut street from Ninth to Tenth, and last night eleven lights were supplied from a dynamo machine located temporarily in the Western Union Telegraph Company's place, at Tenth and Chestnut streets. Three of the lights were erected on the city lamp-posts and the remaining eight in buildings in the vicinity, all supplied from wires in the conduit. The light produced compared very favorably with that from the lamps on the tall poles.

EDISON AND STORAGE BATTERIES.—A cable despatch. from London of the 13th announced that the Edison Electric Light Company had purchased the right for the Faure-Sellon-Volckmar electric accumulators throughout Germany. Mr. Edison told a reporter that the statement was untrue, and that in his opinion it was simply a scheme to boom the Faure stock. He said he had no reason to recede from his previous condemnation of alleged storage batteries, but if a good, practical system of storage ever were discovered, he would indorse it and probably use it. He said it is a question of chemistry, not electricity, and

that chemists have so far failed to produce any feasible method of storing electricity, even from a scientific standpoint. Statements like the one cabled from London were made by inventors and speculators to excite the imagination of the public. They want to get rid of their stock, and make people believe they have a big thing, with plenty of money in it.

THE TELEPHONE.

YELL O!—Mr. W. H. Lincoln, Assistant Manager of the Portland (Me.) Telephone Exchange, is the happy father of twin sons, born Oct. 31.

MARYLAND AND THE NATIONAL CAPITAL.—Telephone connection has been established between Washington and Annapolis and Baltimore and Annapolis.

DOWN IN A DIVING BELL.—Among the novelties at the electrical exhibition at Nice will be a diving bell lighted by electricity and connected with the surface by a telephone.

THE REMOVAL FROM LOWELL TO BOSTON.—General Manager Downs, of the New England Telephone Company, has removed his office from Lowell to No. 40 Pearl street, Boston.

"HELLOING" IN MEXICO.—The Mexican Telephone now has over 400 subscribers in the City of Mexico, and 21 bureaus of the government are connected with the Central Exchange.

COSHOCTON, O.—This city now has telephone connection with Zanesville and intermediate points, and will shortly be connected with the principal towns in central Ohio by the Midland Telephone Company's lines.

A PROMOTION.—Mr. Wm. H. Devine, Jr., of Cincinnati, resigns his place at the desk of the police telephone exchange to take charge of new electrical apparatus to be introduced in expanding the patrol wagon system in that city.

CROSSING THE MISSISSIPPI.—The bridge company at Quincy, Ill., demand heavy toll for carrying across to the Missouri side the wires of the local telephone company, and the telephone company is erecting tall towers on each side of the river from which its wires will be stretched.

THE SPIRAL WIRE.—The spiral telephone wire lately strung from this city to Concord, N. H., via Lowell and Manchester, has been thoroughly tested within the past two or three days, and conversation was carried on perfectly over the entire line, which is about 80 miles, without repeating at any intermediate point.

AN IMPROVEMENT WANTED.—Prof Elisha Gray should return to his suburban home immediately and devote his inventive faculties to the perfection of a telephone appliance which when attached to the ordinary instrument in a newspaper office election nights, will paralyze the person who rings the editors up and asks for returns. There's millions in it.—*Chicago Tribune.*

THE INTERNATIONAL BELL CO.—The International Bell Telephone Company (limited) which controls the Bell rights for the continent of Europe, proposes to issue $250,000 in 6 per cent. bonds to retire its floating debt, and provide money for construction purposes. These bonds will be offered to stockholders only at 80, each holder of six shares being entitled to subscribe for one $100 bond.

A DEAF VARIETY OF OUR RACE.—Prof. Bell, of telephone fame, read a paper on the 13th at the National Academy of Sciences on the formation of a deaf variety of the human race. It was an able paper, and showed that such a variety is forming undoubtedly, under the law of evolution. He assumed that deafness is an evil, and that the formation of this new human variety ought to be stopped.

ACTIVITY IN NEBRASKA.—Since Aug. 1 the Nebraska Telephone Company has put up a second wire between Omaha and Lincoln; built lines from Lincoln to Wymore, 54 miles; from Lincoln to Milford and Seward; from Lincoln to Crete, and from Ashland to Wahoo, in Nebraska, and from Council Bluffs to Avoca, 40 miles, in Iowa. The company has now 420 miles of line, and proposes to open a line from Omaha to Des Moines next month.

SARATOGA SPRINGS, N. Y.—"The system here," says a correspondent, "is fast becoming perfect under the able management of Mr. H. T. Downs, formerly of the Suburban Telephone Company, of Boston, Mass. The service here is perfect in every way, the line and operating department having been put in first-class order during the summer and fall. The monthly increases of subscribers go to show the popularity of the telephone here."

A CURIOUS DUET.—A Vienna correspondent describes a curious telephonic performance he listened to at the electric exhibition: "A lady singing at Baden, about twelve miles from Vienna, was accompanied by a man playing the zither at Kronenburg, about the same distance from Vienna, but on the opposite side of the Danube. The repetition itself was very successful, but the peculiar crackling noise of induction was only too audible and greatly interfered with the performance."

THE TELEPHONE IN THE TROPICS.—The officers of the Tropical American Telephone Company, in a careful review of its business for the past six months, finds that the gross earnings from March 1 to November 1 were over $12,000, and the net earnings nearly 8 per cent. on the 40,000 shares of capital on the basis of $3 per share, which is the highest price the stock has reached in the market. For the previous six months the net earnings were about 6 per cent. on the same valuation. Should a similarly good business be done for the next six months, the managers say, they will probably begin paying dividends on the stock.

EXTENSION IN WISCONSIN.—James Keelyn, of the construction corps of the Wisconsin Telephone Company, who has just returned to Milwaukee from the logging districts in the northwestern portion of the State, reports that the company has opened its line to Black River Falls from La Crosse, connecting Sparta, Mindora and Melrose with the two points first named. Work is to be begun immediately on a line from Black River Falls to Dell's Dam, where connection will be made with a line running to Neilsville, Hemlock and Greenwood, which the company have purchased. The new lines are of great use to the loggers, and, when the contemplated connection is made, will afford communication with La Crosse to a point as far as 105 miles distant from that metropolis of the lumber manufacturing industry. The telephone is proving a great benefit to interior villages, enabling many places, where there is not enough business to warrant the expense of maintaining a telegraph operator, to enjoy facilities for quick communication with the outside world.

AN ACOUSTIC TELEPHONE COMPANY.—The Citizens' Telephone Company, using the Bowen acoustic telephone, has established an office in Pittsburgh. The company has a capital stock of $200,000, in shares of $50 each. Its charter covers nine counties of western Pennsylvania. The announcement says: "The company has a perfect magneto call bell, with improved ear tube attachment, and the sound is conveyed over the wires with remarkable distinctness. The lines consist of light steel-braided wire, thoroughly galvanized, so that corrosion is next to impossible. The line of each subscriber is strictly private, it being impossible to tap them, as in the case of wires conveying sound through the medium of electricity." The company expects to do a large business on a tariff of $35 per instrument for the first year, and $20 per year afterward. The price paid at present for electric telephones is $84 per year.

COMPANIA ELECTRICA DE CUBA.—We have received from Manager V. F. Butler a set of four handsome photographs, two showing respectively the cupola of the central office and the cupola of the branch exchange on the Sucursal, Havana, and the other two giving views of the switchboards in the same exchanges. The switchboards are of the well-known Western Electric pattern. The running of the wires on the cupolas, as shown by the photographs, reflects much credit upon Mr. Butler and Mr. E. C Bailey, an American, who is the engineer of the company. The photographs are mounted on a card 22 x 13 inches, and in the centre are given portraits of Mr. Butler and Mr. Bailey, also of Mrs. Butler, who is the cashier of the company. We understand that the stockholders of the company in this country, or any one else who may desire copies of these photographs, can obtain them at about cost price on application to the Secretary of the company, Geo. M. Phelps, Jr., care Western Electric Company, New York.

POLE CUTTING AT SIOUX FALLS, DAK.—With regard to facts, mention of which has already been made in these columns, a special dispatch from Sioux Falls says: A decided sensation was created this morning upon the discovery that many telephone poles had been cut down during the night and lay prostrated with their load of wires. The exchange here belongs to the Erie Telegraph & Telephone Company, and numbers 125 wires. About three weeks ago the City Council by ordinance ordered the removal of the poles from the street to the alleys. It was surmised that the telephone company were taking measures to enjoin the Council from taking any action, and to anticipate, the Council took the bull by the horns and had the poles on Phillips avenue chopped down early this morning, and when the manager remonstrated he was at once arrested and put in the calaboose. The act of the Council is very generally condemned by the citizens as ill-advised if not lawless, and likely to result in litigation or the removal of the telephone exchanges, or both. Its summary destruction causes great present annoyance to its patrons, to whom it has become a thing of necessity.

MISCELLANEOUS NOTES.

THE TIME TELEGRAPH CO. IN THE SOUTH.—The Southern Time Telegraph Company has been incorporated at Nashville, Tenn., to operate in the Southern States.

THE BENNETT-MACKEY CABLE.—The agent of the new cable has been examining the shore at Rockport, Mass., and stated that it has been decided to locate the terminus there at a spot called Loblolly, at the south end of the town.

TAXING THE CONDUITS.—The City Council of Philadelphia has established a license charge of $10 per mile annually on all conduits, tubes or pipes not over 2½ inches in diameter; $20 on those not exceeding 12 inches, and $40 on those exceeding 12 inches.

THE ELECTRIC MANUFACTURERS' AND MISCELLANEOUS STOCK EXCHANGE will, it is announced, commence business in its new rooms, at Nassau and Pine streets, on Monday, Dec. 3. Mr. A. H. Jocelyn has been appointed secretary, and Mr. Isaac Wilson doorkeeper.

BRUSH PLATING-MACHINES IN DEMAND.—Mr. C. C. Curtiss, general agent of the Brush Electric Co., has just returned to Cleveland from Canada with several orders for Brush plating-machines. He reports the stove business booming over there, hence the demand for the Brush dynamos for nickel-plating.

DANGER FROM ELECTRIC WIRES.—The committee on electric wires of the Boston city government gave a hearing last Friday on a remonstrance signed by 106 residents and real estate owners on West Newton street, against erecting poles and wires on that street. Several witnesses appeared, and urged that it would lessen the value of property, thereby injuring the appearance of the street and increasing the danger in case of fire.

AN ELECTRICAL INDICATOR OF WORK.—A textile manufacturing firm of Boston have adopted an electrical work indicator, which records the movements of all the looms and other machines within their works. The indicator occupies a little more space in their office than a common clock would fill, yet a glance at it will tell how all the operations throughout all the large works are progressing This method of work recording by electricity might be usefully extended into many other mechanical departments. The capability of electricity for purposes of this kind is not properly recognized.

THE VARLEY ACCUMULATOR.—The Varley accumulator or storage battery is described as composed of elements made of cotton or other woven fibrous material, carbonized and placed in cells charged with a saturated solution of two parts of sulphate of zinc and one part of sulphate of manganese, with a small quantity of sulphate of mercury to prevent local action on the deposited zinc. In charging the storage battery, metallic zinc is deposited on one carbon pole and bioxide of manganese in electrical continuity on the other; the latter pole in use absorbing the hydrogen, the former oxygen. The advantage claimed for this battery over the lead accumulator is chiefly its less bulk and weight, with great storage capacity.

THE SIGNAL SERVICE CLOCK.—A clock of peculiar construction, says the *Scientific American*, has been manufactured for the United States Signal Service Bureau at Washington. The case is of brass, and allows the swing of a pendulum 39 inches long; it is air tight, and admits of the air being exhausted and the movement run in a vacuum, thus obviating any possibility of variation due to atmospheric changes. An electrical attachment is connected with the movements, by means of which the clock is wound as it runs, so that there is not the usual liability to variation arising from the differing conditions of the mainspring. This is accomplished by alternately breaking and closing an electric current. The motion thus obtained and the power of the current are used to rewind the spring by means of a worm and other mechanism. The winding keeps exact pace with the running, and the slightest deviation from this standard is shown on an indicator. The train is jeweled, and is therefore little affected by friction.

STOCK QUOTATIONS.—Telegraph, telephone and electric light stocks were quoted on Thursday of last week and Thursday of this week as follows:

	Nov. 8.	Nov 15.
TELEPHONE.		
American Bell Telephone	206	204
Union Telephone	...	80
Bay State Telephone	98	97
Tropical Telephone	1	1¾
Mexican Telephone Co.	2	2⅛
National Bell Telephone of Maine	70	65
New York and Pennsylvania	88	88
Boston & Northern Telephone	100	100
People's Telephone	7⅛	7
Suburban	100	100
Erie Telephone	50	46
New York and New Jersey	90	94
Continental	....	10
Dolbear	....	9½
Missouri & Kansas	....	95
Molecular	....	10
Overland	....	4
Shaw	....	10
Southern New England	....	180
Southern Bell	....	105
Hudson River Telephone	100	100
Globe Telephone	...	20
TELEGRAPH.		
American Cable	63½	61¾
Western Union Telegraph	79⅛	79½
Bankers and Merchants' Tel.	....	138½
Mutual Union Telegraph	17½	17¾
American District Telegraph	16	16
Postal Telegraph Bonds with stock	....	48
ELECTRIC LIGHT.		
Brush Electric Light	80	85
Edison Electric Illuminating	....	71
Edison Electric Light	....	145
Edison Isolated	....	100
U. S. Electric Lighting	112	117
United Globe Electric Light	....	85
Fuller Electrical	....	20
MISCELLANEOUS.		
Commercial Telegram	95	95
Electric Railway of U. S	....	60

BUSINESS NOTICES.

NOTICE TO THE PUBLIC.

OFFICE OF
THE ELECTRIC GAS LIGHTING CO.,
45 Milk Street, BOSTON, Mass., Oct. 25, 1883.

Notice is hereby given that the contract heretofore existing between this company and The Electrical Supply Company of Ansonia, Conn., whereby the latter was licensed to manufacture and sell ELECTRIC GAS LIGHTING APPARATUS, under the patents owned by the former, was canceled by this company on the 20th day of Septemtember, 1883, for nonfulfillment and violation of its terms, conditions and covenants, on the part of said Electrical Supply Company.

Any manufacture or sale of said apparatus by said Electrical Supply Company, since the cancellation of said contract, is an infringement of the patents, and in violation of the rights of this company, and all parties who shall sell, purchase or use said apparatus, thus manufactured, will be held responsible. We have perfected arrangements for the prompt construction of the apparatus by manufacturing electricians who have had extended practical experience in this line of work, thus insuring the production of properly made and perfect working burners, which we shall supply to our agents and patrons in full confidence that they will give entire satisfaction.

We regret the interruption and delay which has been occasioned by the action of The Electrical Supply Company, but its failure to furnish the apparatus according to contract, and the small amount which it did furnish while said contract was in force, was so defective in construction and inferior in quality, that it became our imperative duty to ourselves and our patrons, to exercise our right to terminate the contract for breach of its conditions.

THE ELECTRIC GAS LIGHTING CO.,
by Louis W. Burnham, President and Business Manager.

INSPECTORS, linemen, superintendents and others connected with telegraph, telephone and electric light companies whose duties compel them to go out in all weathers are especially subject to colds. Although these may not cause much alarm at the time, they may result seriously in case proper precautions are not taken. Sudden change in the weather and exposure to the raw and chilly night air, with insufficient wraps—especially after one has been for several hours in a warm office, and perhaps has to ride in a cold car or to walk in a storm—and the first warning is a "slight cold," soreness and irritation in the throat. The long list of fatal diseases of which a neglected cold is the precursor need not be recorded here. The simplest, surest and best remedy for coughs of recent or long standing, colds and hoarseness, is Hale's Honey of Horehound and Tar. The ingredients are pure and harmless, and their combination makes this remedy most prompt and effectual. A slight cold from exposure in riding over his Mount Vernon estate on a raw day in December rapidly developed into inflammation of the throat and tonsils (quinsy), which ended the life of the "Father of his Country." A single package of Hale's Honey of Horehound and Tar would probably have checked the fatal disease and saved his valuable life. This well-known and valuable medicine is for sale by druggists and dealers in medicine everywhere on this continent. It is put up in two sizes. The quantity in the $1 bottle is treble that in the 50 cent bottles. Owing to its popularity, worthless imitations have arisen of Hale's Honey of Horehound and Tar, and purchasers should be careful to obtain the genuine with the name of C. N. Crittenton, proprietor, on each bottle.

MUSIC EVERYWHERE.—That wonderful musical instrument, for sale by Mass. Organ Co., 57 Washington street, Boston, Mass., the Organetta, is advertised in this issue. It is an ideal home instrument. You can dance to it; you can sing to it; a mere child can play it; it inculcates a love of music in old and young, and develops and cultivates the ear. The music is perfectly accurate, and the wonderful Organetta will play any tune. At the price, $3.50, it is within the reach of all.

THE MARVELOUS SINGING DOLL.—This charming novelty is advertised is this issue by Mass. Organ Co., 57 Washington street, Boston, Mass., and certainly nothing will appeal more quickly to the children than a Doll that will sing a song. The price is very reasonable, the Doll is a beautiful affair, and the ingenious singing attachment will delight the young and amuse the old. The little girl who finds a Webber Doll "in her stocking" at Christmas time will be the envy of all.

DEAR SIR: The beautiful Singing Doll came safely, and far exceeded my expectation of what a Singing Doll could be. Our little folk were charmed with its beauty, but when it sang, their delight was unbounded. It will be to them a thing of beauty and a constant joy. Sincerely yours, REV. J. B. ABBOTT.

MEDFORD, Mass., Aug. 13, 1883.

THE "ELECTRICAL WORLD'S"
ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

ALL THE PATENTS MENTIONED BELOW ARE DATED NOV. 6, 1883.

Armature for dynamo-electric machines. J. E. Giles, of Hazleton, Pa..... 288,051

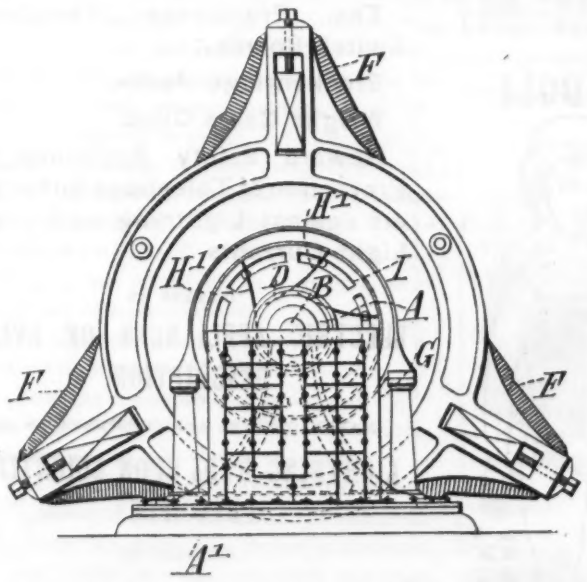
The armature core is built up of a series of iron rings, placed axially in line, and having on one or both of their lateral faces a number of oblique ribs. Each rib being separated from the adjacent ring by a strip of insulating material, the whole series of rings being clamped between apertured heads secured to the armature-shaft. The object of the improvement is to secure air-circulation in the armature to carry off heat.

Automatic crank-switch for telephone call-boxes; C. E. Scribner, of Chicago, Ill., assignor to the Western Electric Manufacturing Company of same place..... 287,873

In this switch the shunt-circuit of the revolving armature-coil is automatically broken when the crank is set in motion. The crank-arm in this case is the switch-lever having a contact point pressed against a contact disc by a spring. The shunt-circuit is broken by pressing the crank toward the call-box.

Dynamo-electric machine; W. B. F. Elphinstone, of Carberry Tower, Musselburgh, Scotland, and C. W. Vincent, of Holloway, County of Middlesex, England. 288,042

The design of this invention is to arrange dynamo-electric machines so that under greatly varying circumstances they will admit of being worked economically with respect to the power



used to drive them. In this dynamo the exciting current is divided up, and separate and distinct currents are sent through one or more of the coils of the field magnets *F*, as circumstances may require. The terminals of each coil are connected with the grouping tablet *G*, with which are connected the wires conveying the exciting current.

District, police or fire telegraph; Frederick Pearce, of New York city..... 288,107

An automatic circuit-breaker in the call-box denotes the number or letter of the box, and the box is provided with a key and sounder by means of which communication may be had with headquarters, while the automatic circuit-breaker is held in a fixed position. At the central office the signals are recorded on a strip of paper.

Electrical apparatus and method of controling paper; J. W. Osborne, of Washington, D. C., assignor to W. H. Forbes, of Boston, Mass.. 287,957

This invention consists in the utilization of the attraction which bodies have for each other when charged with electricity of opposite polarities and the repulsion which they manifest when charged with electricity of the same kind. This principle is applied to holding, feeding and delivering paper or other material.

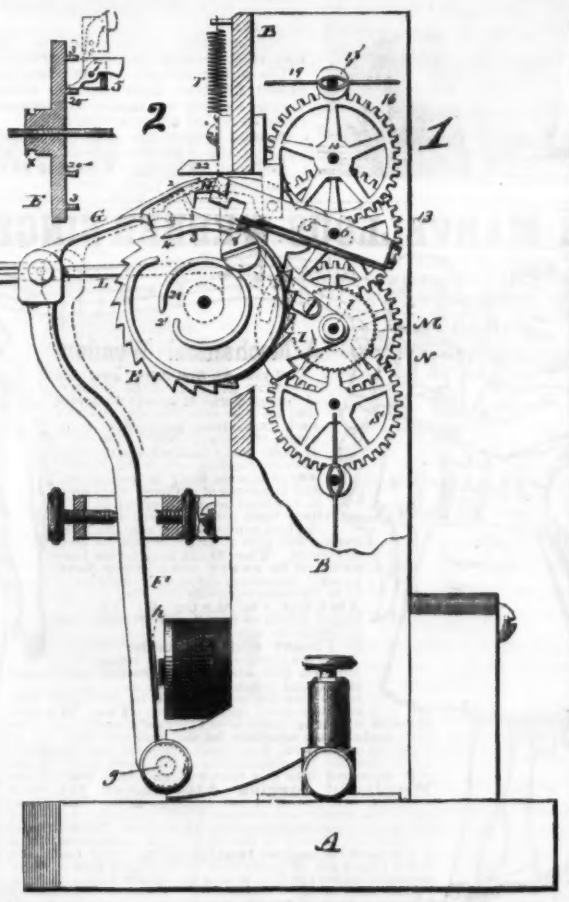
Electric igniting device for gas engines; L. C. Parker, of Yonkers, N. Y..... 287,855

A disc carrying a series of contact pins is rotated intermittently in the cylinder of the engine. The pins make and break contact with a spring acted finger, the finger and the pins being in an electric circuit in which there is a dynamo, or a battery and a spark-producing coil, a spark which ignites the gas is produced at the point of rupture.

Galvanic battery cell; L. E. Felton, of Potsdam, N. Y.. 287,812

A containing vessel of rubber has its top vulcanized on. The negative element is permanently secured in an aperture in the top, while the positive element is inserted through a neck formed in the top of the vessel. The battery is rendered portable by removing the zinc-rod and inserting in the neck a rubber stopper.

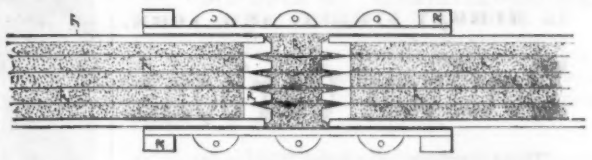
Station-call for electric circuits; T. W. Mather, of New Haven, Conn..... 288,089



This station call is designed for telephone circuits, and arranged to operate only when the particular number of the station is required. An electrically operated pawl *G* engages a count-wheel *E*, having one or more recesses on its periphery according to the number of the station, and a lever operating in combination with the count-wheel falls into the recess or recesses as the count-wheel is stopped, but the swinging movement of the lever is so slow that unless the count-wheel be stopped at the recess it will readily pass the lever without operating it. Whenever the lever falls into a recess in the count-wheel it switches the current from the line to the bell and effects the call. There are in this ingenious apparatus various details of construction and operation which cannot be described without presenting the entire specification.

Means for insulating, carrying and laying electric wires; F. W. Brown, of Rochester, N. Y..... 288,002

The tubing *T* contains any required number of wires, insulated and protected by the surrounding pulverized non-conducting filling *F*. The wires pass out at the ends of the tube through non-conducting plugs *P*, in the conical openings



of which the wires are connected. The sections of the tubes are connected by semi-cylindrical pieces which are filled with the non-conductor after the wires are joined.

Lightning-rod coupling; Wm. Hewitt, of London, Ont., Canada..... 287,929

The principal object of this invention is to provide a continuous open passage through the coupling in the line of each groove of the rod to allow water to pass through without lodging in the joint.

Lightning-arrester; C. S. Shepard, of Raymond, N. H...287,875

This device is especially adapted for use in connection with private telephones. It consists of a frame having on its face metallic strips connected with the binding posts and divided by an interspace, and a hinged strip capable of folding over the other strips to make connections between the line-wires and the ground.

Telephone support; Chas. H. Obly, of Sandusky, assignor to A. J. Frederick, of Oberlin, O..... 288,183

This is a hinged arm supported by a fixed bracket and having at its free end spring holders for supporting the telephone receiver in proximity to the ear.

Telegraphic transmitter; M. H. Dement, of Chicago, Ill. 287,914

This device is intended as a substitute for the ordinary transmitting key. Each letter of the alphabet may be transmitted by a single depression of a key.

Telephone receiver; S. H. Bartlett and H. E. Waite, of New York city, assignors to the Molecular Telephone Co., of same place..... 287,896

The magnet in this telephone is provided with a spring arm which is returned upon itself and carries a disc which is moved readily by the variations in the strength of the magnet. The disc may be of either magnetic or non-magnetic material.

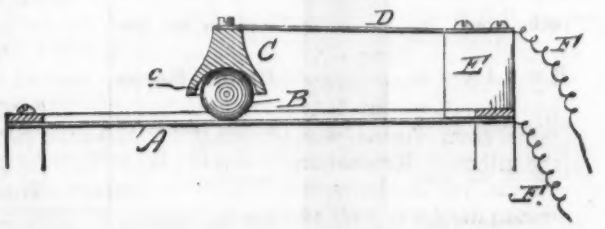
Telegraph insulator; C. H. Honsdale, of Cleveland, O.. 287,830

This insulator is made of paper-pulp.

Voltaic-arc light; William Baxter, Jr., of Jersey City, N. J..... 288,157

This is an improvement in the class of arc-lights which are burned in a closed receiver.

Telephonic transmitter, Henry Clay, of Philadelphia, Pa..... 288,017



A small sphere of carbon is held in contact with the diaphragm by means of a concave, spring-pressed carbon cup. The current passes through the diaphragm through the carbon sphere and through the carbon cup and its supporting spring, and is varied at the point of contact between the sphere and diaphragm and the sphere and the cup.

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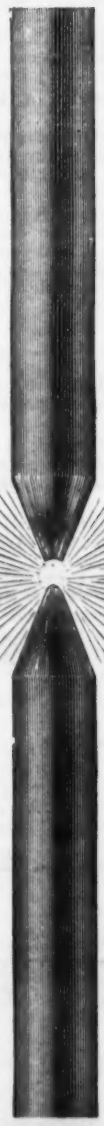

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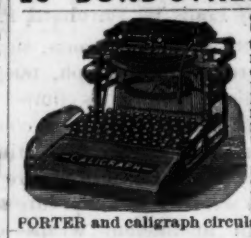

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6th. It relieves the subscriber of any duty but to answer his calls, and renders it impossible for him to interfere with others through ignorance or neglect.

7th. It is exclusively a magneto call, requiring no battery, and combines, in a very handsome box but little larger than the ordinary magneto bell, the individualizing apparatus, local generator for calling Exchange, bell and telephone switch.

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The agitation of each separate molecule comprising the central portion of the Spiral Wire is in a **direct** line with the length of the wire, the electrical current having an **unretarded straight** circulation through the central core from end to end, **protected** by four or more spirally arranged surfaces on the exterior of said wire, which convey continuous spiral currents, constantly throwing aside the adjacent inductive currents of other parallel wires, and also all atmospheric influences likely to retard the reproduction of articulation; hence **INSTANTANEOUS** reproduction of articulation from end to end of the spirally grooved wire over unlimited distances.

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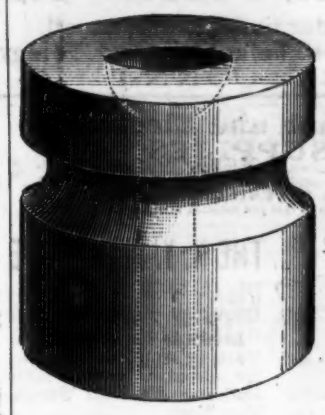

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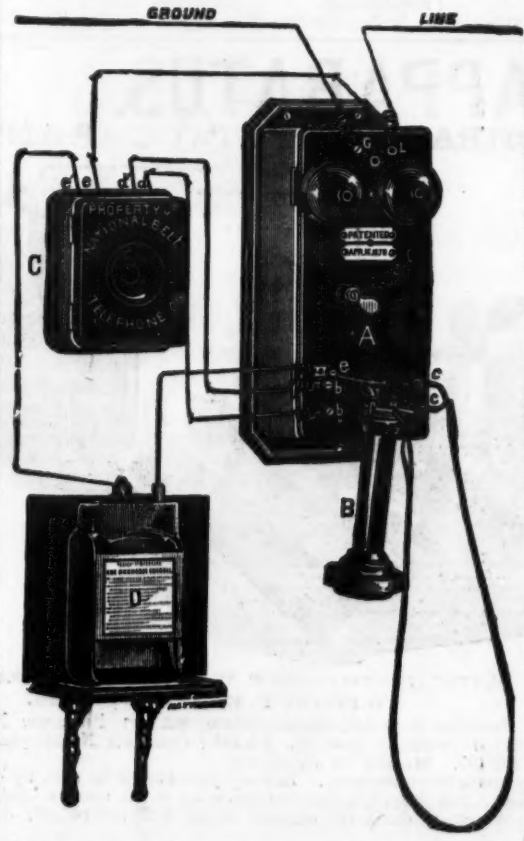

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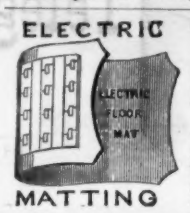

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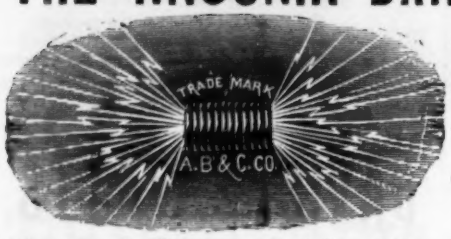

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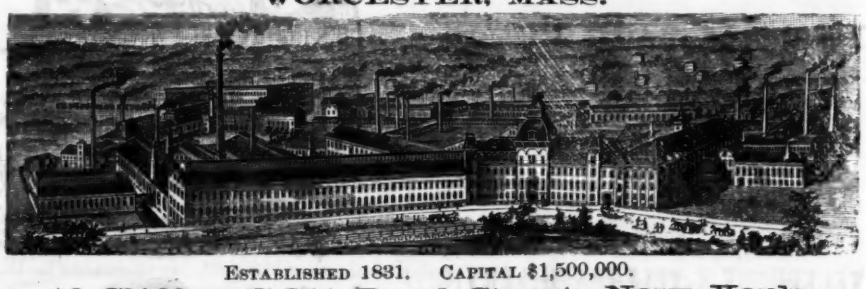

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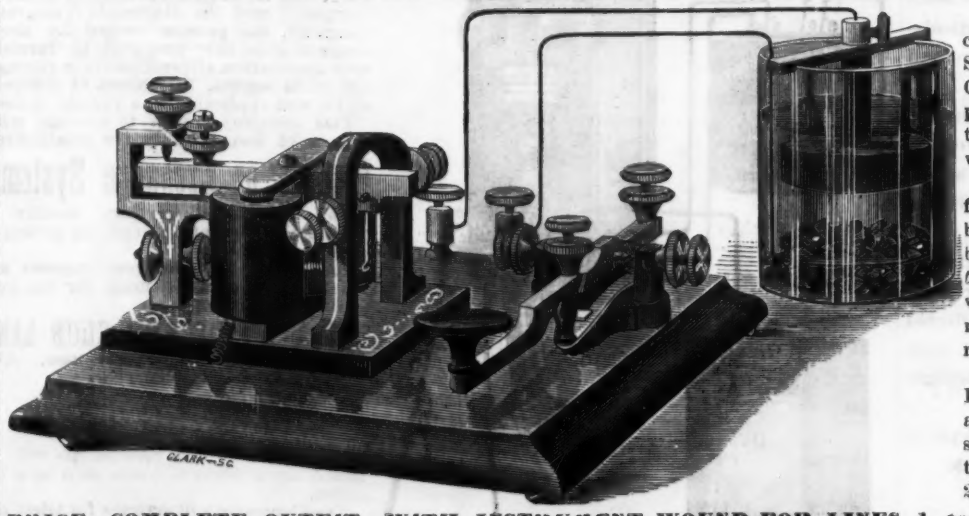

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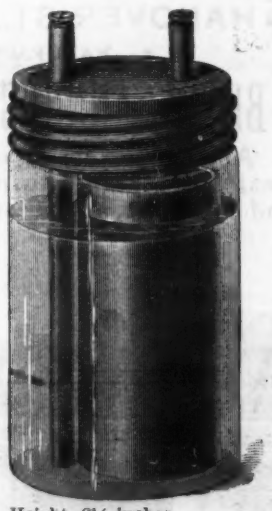

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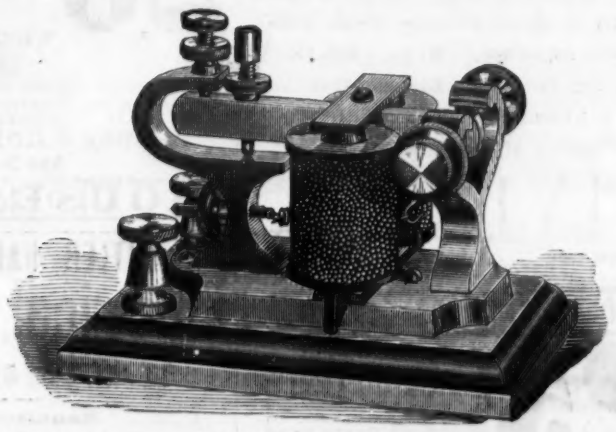

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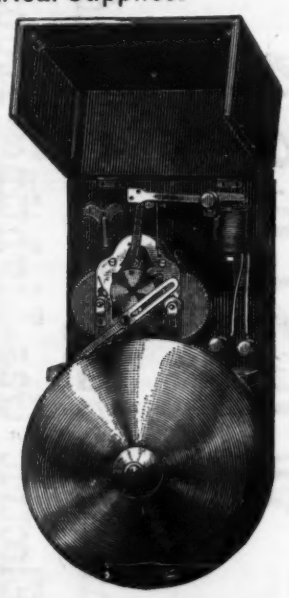

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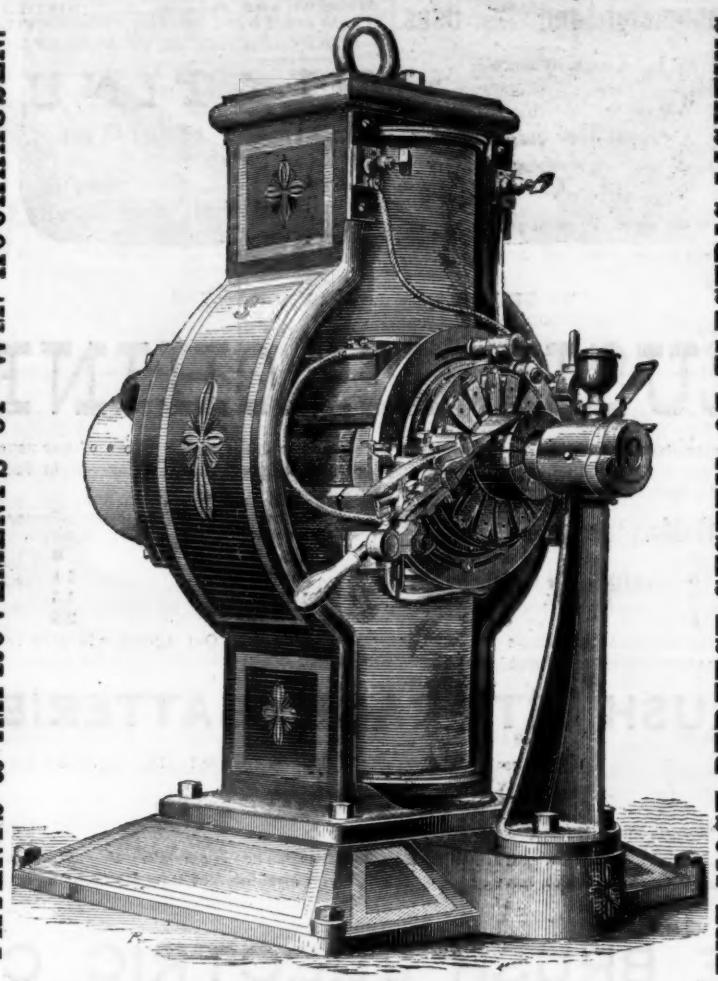

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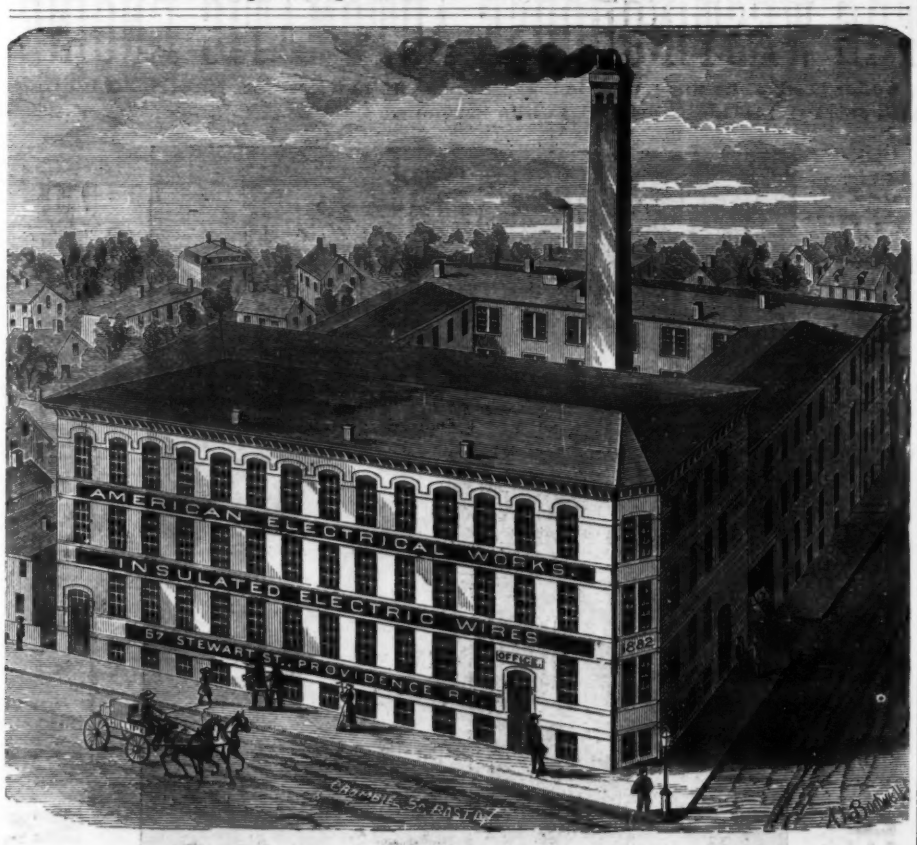

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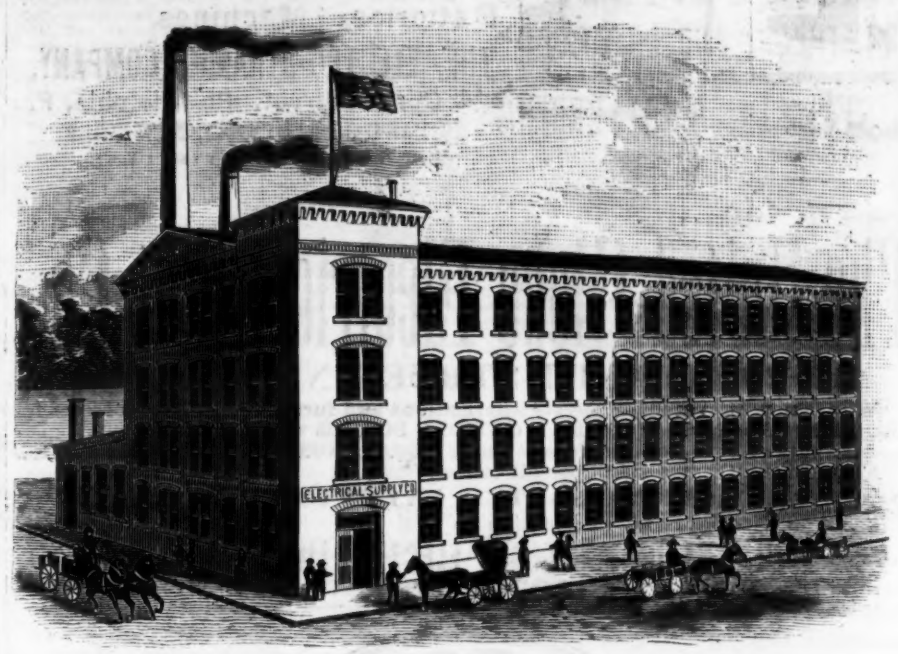

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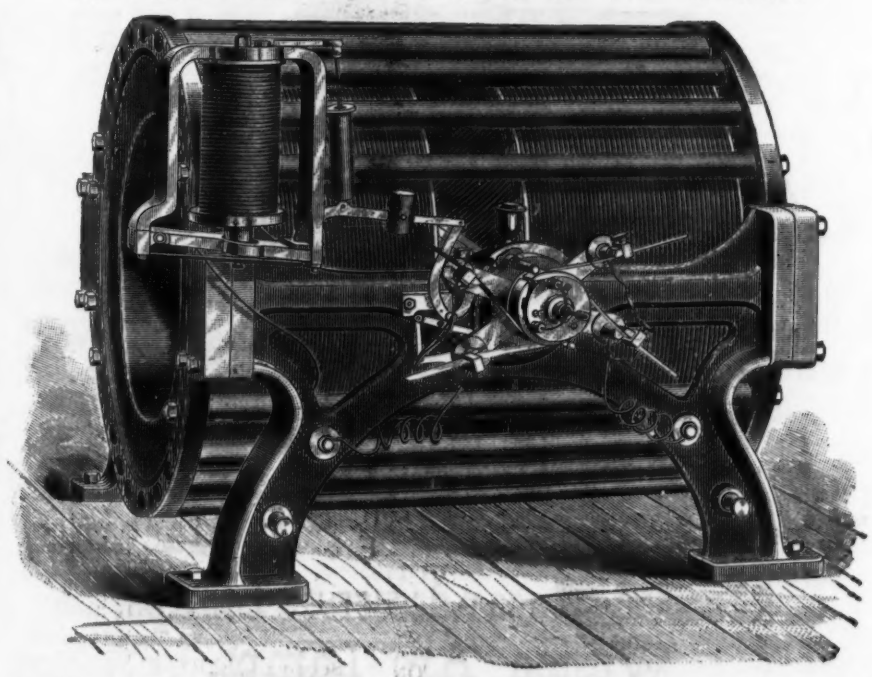

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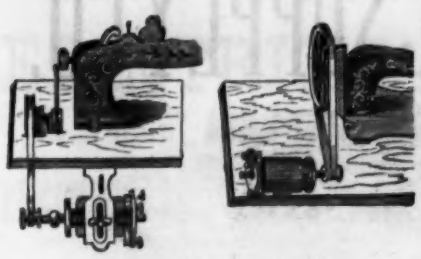

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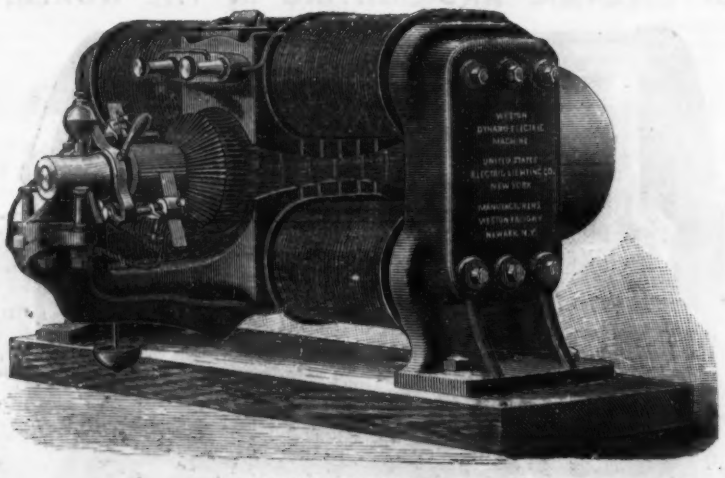

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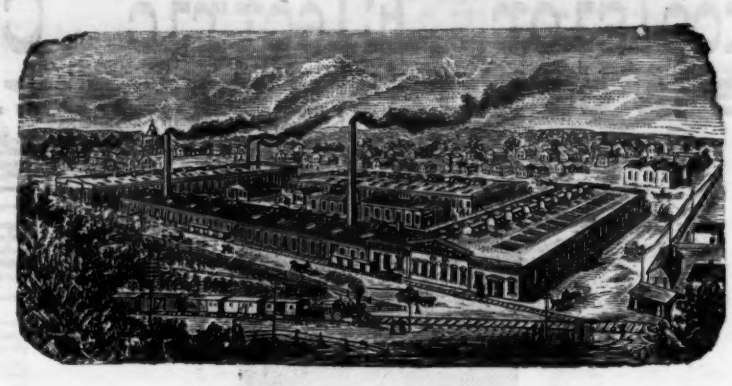

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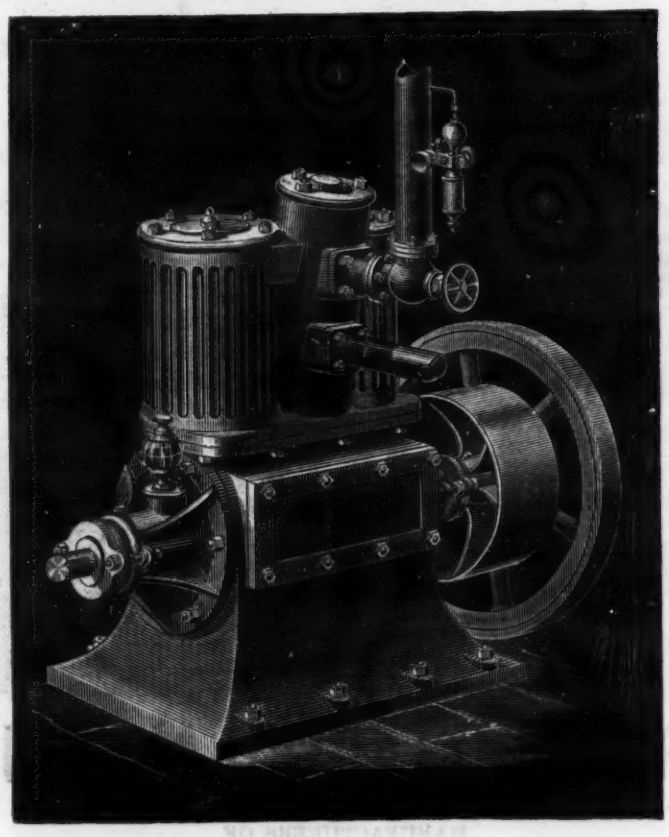

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